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1903

HUMAN AND BOVINE TUBERCULOSIS.

By Dr. M. P. Ravenel, Bacteriologist of the State Live Stock Sanitary Board of Pennsylvania, Philadelphia, Pa.

The past decade has seen the awakening of a widespread interest in the study of tuberculosis, the spirit of Oriental fatalism which has for so long led us to view with equanimity the awful loss of life annually inflicted by this great white plague having given way to an active campaign against its ravages, a campaign so far largely one of eduction, in which we strive to spread far and wide the fundamental fact that tuberculosis is a communicable disease, and from that fact, preventable. If preventable, why not prevented? With these precepts firmly implanted in the minds of the medical profession, as well as of the general public, we have reason to hope that each year will see a more careful study of the methods by which tuberculosis is spread and the means to be adopted for its prevention. On every hand societies for the prevention of tuberculosis are being formed whose object is to teach the truth concerning the disease and to dispel those false notions, chief among which may be mentioned belief in the hereditary character of tuberculosis, which in the past have led us to regard the tribute of human life as inevitable.

The intelligent prophylaxis against any disease demands a thorough understanding of the methods by which it is spread. The whole world is in accord in assigning the chief rôle in the propagation of tuberculosis to the inhalation of particles of sputum thrown off by phthisical persons, the majority of the profession agreeing with Cornet in the belief that sputum is most dangerous when dried and pulverized, while others follow Flugge in regarding the moist floating particles thrown out during coughing, sneezing, etc., as most to de dreaded. The danger to mankind from tuberculosis of cattle has been discussed at a length and with a fervor not surpassed in the history of modern medicine. The immense practical importance of the subject to the medical profession, to those charged with making and enforcing laws for the preservation of the health of the community, no less than to every man, woman and child, justifies our deepest interest and most earnest studies.

The relation that exists between human and bovine tuberculosis, and the part played by cattle in spreading the disease among mankind, is now the great question to which attention has been drawn with renewed activity by the attitude of Professor Koch, announced in his paper before the British Congress on Tuberculosis, in July, 1901. This paper was the more striking, in that it contained statements diametrically opposed to the former teaching of Koch that "bovine tuberculosis is identical with human tuberculosis, and is thus a disease transmissible to man." This belief was the outcome of the experiments made by Koch at the time of his discovery of the tubercle bacillus, and has been generally accepted by the medical and veterinary professions up to the present time. So much has been written of late on the subject that I will pass over minor differences of opinion and at once take up the consideration of the two main propositions which were formulated by Koch, and which include all points of controversy in the discussion of the relation between human and bovine tuberculosis.

1. Human tuberculosis differs from bovine and cannot be transmitted to cattle.

2. Though the important question whether man is susceptible to bovine tuberculosis at all is not yet absolutely decided, and will not admit of absolute decision to-day or to-morrow, one is nevertheless already at liberty to say that if such a susceptibility really exists the infection of human beings is but a very rare occurrence. I should estimate the extent of infection by the milk and flesh of tuberculous cattle, and the butter made from this milk, is hardly greater than that of hereditary transmission, and therefore do not deem it advisable to take any measures against it.

The first of these propositions is susceptible of direct experimental investigation, and can therefore be answered positively without going into the domain of theory. Professor Koch based this statement on the result of an insufficient number of experiments done by Professor Shutz and himself. A number of young cattle proved to be free from tuberculosis by the tuberculin test were infected in various ways with the bacilli of human origin or with tubercular sputum. "In some cases the tubercle bacilli or the sputum were injected under the skin, in others into the peritoneal cavity, in still others into the jugular vein. Six animals were fed with tubercular sputum almost daily for seven or eight months; four repeatedly inhaled great quantities of bacilli, which were distributed in water and scattered with it in the form of spray. None of these cattle, there were thirteen of them, showed any symptoms of disease, and they gained considerably in weight." After six to eight months they were killed and no trace of disease was found in the internal organs. Where the injections were made small foci of suppuration had formed in which there were found a few bacilli.

Inoculations of a similar nature with bacilli from the lungs of an animal with bovine tuberculosis resulted always in rapid illness, ending often in death, while some were killed in a miserably sick condition after three months. In all cases there was extensive tuberculosis, involving the internal organs, especially the lungs and spleen.

A similar difference in pathogenic power was found in feeding experiments on pigs, where one lot of six received human tubercular sputum, and a second lot of six were given pure cultures of the bovine tubercle bacillus: and also in experiments on asses, sheep and goats, where the inoculations were made with pure cultures of human and bovine bacilli into the circulation.

Results similar to these in the main have been obtained by Smith, Frothingtham, Dinwiddie and at the laboratory of the State Live-stock Sanitary Board of Pennsylvania, and we may admit that, as a rule, cattle show a high degree of resistance to the human tubercle bacillus, and that for all experimental animals the bovine bacillus has a pathogenic power equal to the human bacillus, while for the great majority it is vastly more pathogenic; but this does not by any means show that man is not susceptible to infection by the bovine organism, and we have abundant proof that it is quite possible to infect cattle with the tubercle bacillus from human sources.

The identity of tuberculosis as seen in man and in cattle was held by Villemin, who believed he had proved the correctness of this view in his inoculation experiments, by which he showed conclusively that small animals like rabbits became tuberculous following the injection of material from man as well as cattle. Chauveau was, however, the first to make the attempt to infect cattle with tubercular material from man, and his success is shown in the following abstract of his experiments:—

"Three animals were used, and as controls there were three other similar animals which were infected with bovine material, and also three which were not infected at all, these last remaining free from tuberculosis. Those to which bovine material had been fed, as well as those which received human material, all became tuberculous. At the autopsy it was impossible to distinguish one set from the other. In all of them the lesions provoked showed the same character. This was infection by the digestive tract.

"The next series was infection by intravenous injection. A calf three months old was inoculated into the jugular vein with two cubic centimeters of an emulsion made from the lung of a child with acute miliary tuberculosis. It was killed on the twenty-ninth day. The lesions were confined to the chest, the bronchial and mediastinal ganglia showing the most marked changes. In the lung, on section, there were found well marked gray granulations accumulated in the interior or around the small bronchi, which they sometimes occluded entirely. This was well seen with the naked eye, but was better demonstrated in microscopical sections.

"The third series was infection by subcutaneous inoculation. Seven animals were inoculated. For three animals the material used was obtained from gingus masses from the joints in cases of white swelling; for three others from acute miliary tuberculosis; and in one from the lung of a horse which had developed a marked pulmonary tuberculosis due to the intravenous injection of material from the lung of a man. In all cases a tumor developed at the point of inoculation, which Chauveau described as being a tuberculous tumor altogether typical. The neighboring glands showed always more or less involvement, but in no case was there any general infection."

I have quoted these experiments at length for the reason that they seem often to be overlooked, and for the further reason that they have recently been directly misquoted. Koch said in his address before the British Congress on Tuberculosis, "If one studies the older literature of the subject, and collects the reports of the numerous experiments that were made in former times by Chauveau, Gunther and Harms, Bollinger and others, who fed calves, swine and goats with the milk and pieces of the lungs of tubercular cattle, we find these always fell ill of tuberculosis, whereas those that received human material with their food did not."

Bollinger in 1879 inoculated a young calf in the peritoneal cavity with material from a human lung. When killed after seven months the mesentery and peritoneal covering of the spleen presented a number of tumors from the size of a pea to that of a walnut and which microscopically were identical with those found in pearly disease under natural conditions. The retroperitoneal and mesenteric glands were tuberculous also.

Klebs caused a tuberculosis of the peritoneum identical with what is seen under natural conditions by the intraperitoneal injection of human tubercular material.

Crookshank injected tuberculous sputum into the peritoneal cavity of a calf, causing death on the forty-second day. The autopsy revealed extensive disease. "Extending over the mesentery from the point of inoculation there were hundreds of wart-like, fleshy new growths, some quite irregular in form, others spherical or button-shaped. There were similar deposits on the under surface of the liver, on the spleen, in the gastrosplenic omentum, and on the peritoneal surface of the diaphragm. On microscopical examination extremely minute tubercles were found disseminated throughout the lungs and liver. Tubercle bacilli were found in these organs and in the peritoneal deposits."

Sydney Martin fed human tuberculosis sputum to six calves. Four of these received each seventy centimeters mixed with their food at one meal. They were killed after thirty-three, sixty-three, eighty-five, and two hundred and eighty-five days. The first three showed respectively fifty-three, sixty-three, and thirteen tubercular nodules in the intestine, while the fourth was entirely free. The two other calves were given four hundred and forty cubic centimeters of sputum at one feeding. One was killed after fifty-six days, and showed tuberculosis of the intestine and mesenteric gland. The other was allowed to live one hundred and thirty-eight days, and was free from disease when killed.

There are on record a few instances of cattle becoming infected with tuberculosis through the sputum of phthisical attendants. In several of these evidence is so clear as to leave no doubt that cattle are at times infected in this manner. Such instances have been reported by Cozette, Cliquet, Huon, director of the vaccine laboratory at Marseilles, and Bang. In most of these cases the sputum was introduced into the digestive tract with the forage, as well as inhaled in the dry state, but in Huon's animal the infection seems to have been entirely through inhalation.

I come now to speak of the work done at the laboratory of the State Live-stock Sanitary Board, the results of which you see illustrated in the specimens presented here for your inspection and study. I cannot feel but that these specimens possess an unusual interest and importance in the solution of a problem which is now engaging the attention of scientific men throughout the world, and which has been made the subject of special investigation by the governments of many countries. Our first successful attempt to infect cattle with human tuberculosis was made in 1898, when four calves of nearly the same age, four to five weeks old, received intraperitoneally ten cubic centimeters of human tuberculous sputum from different sources, but in all cases containing a large number of bacilli. One showed no ill effects except a slight rise in temperature, and the autopsy was entirely negative. Of the other three, two had persistent high temperature following the injection, but only one showed marked illness otherwise. Post-mortem examination proved that all had become infected with tuberculosis, the lesions in two being quite extensive.

For several years past we have endeavored to obtain material from cases of tuberculosis in children in whom there was evidence of infection through the alimentary tract, reasoning that if children contracted tuberculosis through the injection of milk from diseased cattle we would be most apt to find bacilli of the bovine type in these intestinal or mesenteric lesions. So far only three cases have come to us, all through the kindly interest of Dr. Alfred Hand, and in only one of these was the evidence of primary intestinal infection clear. We have isolated from the mesenteric gland of this child, the immediate cause of whose death was tubercular meningitis, a culture which has for cattle the most intense pathogenic power. Two calves inoculated into the jugular vein and peritoneal cavity died in nineteen and twenty-seven days respectively; and a grown cow which was inoculated both in the jugular vein and peritoneal cavity died in eighteen days. All of these animals exhibited marked symptoms from the day of inoculation. Examination of the lesions, both macroscopical and microscopical, leaves no doubt that the animal succumbed to a pure tuberculosis.

In the second proposition Professor Koch calls in question the possibility of the transmission of tuberculosis from cattle to man, and holds that if such transmission ever does take place it is a very rare occurrence, so rare, indeed, as to render superfluous any measures of precaution against it.

In the solution of the problems here involved, we are of necessity deprived of direct experimental data, so must gather evidence from every possible source, collate and weigh it carefully in order to draw fair conclusions.

In the first place, we may well ask if tuberculosis in cattle is marked by any specific features which differentiate it from tuberculosis in man, and which would make it improbable that the two were intercommunicable. I will not attempt here to go into a discussion of all the forms of bovine tuberculosis, or to compare it minutely with the disease in man. The chief differences are: (1) The marked tendency to calcification rather than the caseation seen in man; and (2) the formation of extensive new growths in the serous membranes, such as the pleuræ and peritoneum.

These growths assume wart-like, or cauliflower, or grape-like shapes, from which the names "perlsucht," "pearly disease," "pommeliere," and "grape disease," as applied to bovine tuberculosis, are derived.

In cattle as in man, the lungs are the chief seat of the disease. In about half of all cases the lungs and serous membranes are simultaneously affected —the lungs alone in about one-third, and the serous membranes alone in about one-fifth.

The histological identity of human tuberculosis and pearl disease was first demonstrated by Schuppel, and his work has been supplemented by Baumgarten, who has observed characteristic caseation, such as occurs in the human tubercle, take place in the nodules of pearl disease, "in a typical form and with like regularity." The process is often obscured by rapid calcareous changes, which, he justly remarks, are terminal, and have nothing to do with the actual disease, and which, furthermore, are often seen in human tuberculosis. On the other hand, it has repeatedly been shown that typical miliary tuberculosis can be produced by the bovine bacillus, and as seen in the specimens, photographs of which I will pass around, the same result may be brought about at times by the human bacillus. In fact, experimental tuberculosis in cattle induced by inoculation with the bovine tubercle bacillus is usually of the miliary type, and only exceptionally assumes the form considered typical of the natural bovine disease. In this connection Hueppe very aptly calls attention to the fact that Koch in his experiments with the bacilli of bovine tuberculosis, produced in cattle "only tuberculosis, but not the tuberculosis of the pleura peculiar to the ox, the so-called perlsucht; his experiments, therefore, in the sense of his special interpretation, did not even prove that bovine tuberculosis affects the ox." It has been further shown by Troje and by Dr. Theobald Smith that pearl disease may be produced in rabbits by the human tubercle bacillus. Troje has observed one case of pearly disease affecting the pleura in man.

The differences noted between tuberculosis of man and tuberculosis of cattle are scarcely greater than those noted between the latter and tuberculosis of swine, yet nothing is easier than to infect swine with the milk or other products of tuberculous cattle. The infection here is by natural methods, and in fact is most often noted where nothing was further from the wishes or intentions of the unconscious experimenter. The origin of the infection is unquestionably bovine, yet the disease produced differs markedly, but not essentially, from that seen in cattle. The evidence then leads us to conclude that such differences as are commonly seen between human and bovine tuberculosis are in no sense essential.

That there were certain differences to be observed in cultures of the tubercle bacillus isolated from man and from cattle was shown by Dr. Theobald Smith in 1896, who confirmed his first observations in 1898, his human cultures being almost always obtained from sputum. A study similar to Doctor Smith's has been carried on at the laboratory of the State Livestock Sanitary Board of Pennsylvania for several years, the material for the cultures being obtained from divers sources. With one exception, which was isolated from sputum, all the human cultures have been obtained from internal organs, especially the lungs and mesenteric glands. Two of the bovine cultures have been found in milk, the others coming from internal organs or glands. The result of our observations, which have agreed closely with those of Doctor Smith, is as follows: The morphology of the bacilli in cultures of bovine origin is more uniform and constant than in cultures from man. The bovine bacilli are thick, straight and short, seldom more than 2μ in length and averaging less. In the early generations many individuals are seen which are oval, their length not more than double their breadth. They stain evenly and deeply with carbol-fuchsin, beading being almost always absent from young cultures and often from old ones.

The human bacilli are, as a rule, much longer from the start, and tend to increase in length at once in subcultures. They are generally more or less curved, some cultures showing S-shaped forms. They stain less intensely with carbol-fuchsin, and beading is generally seen, even in early growths.

The above characteristics are most marked and most persistent in cultures grown on blood serum.

Human bacillus, as a rule, grows more easily and abundantly from the first, and will grow well on glycerin agar in subcultures made directly from the original growth on blood serum. All attempts to obtain a like result with the bovine organisms have failed.

The morphological distinctions tend to disappear also in the tissues of susceptible animals. We may inoculate a typical bovine culture, and in a very short time scrapings from the various organs will show long and very much beaded bacilli.

The most striking dissimilarity is, however, seen in the action of the bacilli from the two sources on animals. By whatever method of inoculation the bovine bacillus, as a rule, possesses a very much greater pathogenic power than the human bacillus for all animals on which it has been tried, the only exceptions being possibly those animals, like guinea pigs and swine, which are so extremely susceptible to both types that it is hard to draw any distinction between them. This was the case with swine inoculated by feeding in our own experiments, but Koch and Shutz found that for swine also the bovine bacillus was much more active. The list of animals for which this increased virulence has been proven includes horses, cows, asses, sheep, goats, dogs, cats, rabbits, guinea pigs, and recently the same thing has been shown to hold true for man's relative, the monkey, by de Jong, de Schweinitz, and Schroeder, and ourselves.

In our own experiments two monkeys inoculated subcutaneously with culture L, obtained from milk, died on the thirty-third and thirty-seventh days respectively, while the corresponding pair of the same species, and as nearly the same weight as possible, inoculated with culture M from human sputum, lived fifty-four and ninety-six days respectively, the last being chloroformed in a moribund condition. Two other monkeys which were inoculated by feeding five times with the same cultures smeared on banana, lived forty-two and ninety days respectively. The post-mortem examinations showed for the animals which received the bovine cultures a more active invasion and more acute process.

In trying to interpret the results obtained by inoculation of animals we are forced to ask ourselves whether or not they are applicable to man also. Having proven that for practically all experimental animals the bovine tubercle bacillus possesses, as a rule, a much greater pathogenic activity than the human, is it fair to conclude that this increase of virulence will hold good for man also? Until the contrary is proven, or until good reason for believing the contrary is shown, I feel that this must be our conclusion. This matter opens up a most fascinating field for speculation, in which we meet with many apparent contradictions; and until we gain a better understanding of immunity in general we cannot speak dogmatically, but must stick to ascertained facts in each individual case. Virulence is a factor which is relative to the subject, and exaltation of virulence for one species of animal does not necessarily prove an increased power for other species. Indeed, the reverse is sometimes true. For example, streptococcus is said to become increased in virulence for mice by successive passages through these animals, but less virulent for rabbits. So, too, the bacillus of "rouget du porc," though but slightly pathogenic for rabbits, rapidly acquires a high degree of virulence for them by successive passages; but when it has taken place we find that all virulence for swine, from which it came in the first place, has disappeared. Large doses do not even make them ill.

Admitting freely all these facts, we must regard them as exceptional, for it is a firmly established rule in bacteriology that when the virulence of a pathogenic organism is increased for one animal it is increased for all that are naturally susceptible to its action, as well as for those in which the disease is known only experimentally.

While we cannot determine the virulence of the bovine tubercle bacillus for man by direct inoculation, we are, nevertheless, not without some information on this point, owing to the accidental inoculations observed from time to time. Four such cases have been reported to the Pathological Society of Philadelphia, accompanied in three instances by the exhibition of the specimens.

Similar cases have been reported by Tscherning and Pfeiffer, the latter ending in general infection and death.

Dr. M. B. Hartzell has also observed two cases in which the bovine origin of the infection was not absolutely proven, though certainly highly probable, both occurring in healthy men who were employed by one of our large railways to clean and repair cattle cars. In both a well marked tuberculosis of the skin of the verrucous type followed slight wounds of the back of the hand inflicted by broken timbers. One man recovered under local treatment, but the other died after about a year, through involvement of the lungs and other organs. This patient was a robust man, aged forty-four years, weighing one hundred and seventy-five pounds, with good personal and family histories. Doctor Hartzell felt that he was able to exclude with reasonable certainty any other source of infection. The death of Mr. Thomas Wally, principal of the Royal Veterinary College of Edinburgh, is also attributed to infection gaining entrance through a wound received while making an autopsy on a tuberculous cow.

The interest which has been aroused by Professor Koch's paper has brought out numerous reports of such cases, which are now being published to show that man has something to fear from bovine tuberculosis.

Dr. Kurt Mueller, a surgeon of Erfurt, described the cases of two healthy young men who were under his care. Both were butchers, and, in both, cuts were sustained while working on tuberculous cattle, the wound opening the synovial sheath of a tendon in the hand. In each case an operation was necessary, and it was found that the walls of the sheath, as well as the tendon itself, were thickened, while upon them were large numbers of yellow nodules, proven to be tubercles by microscopical examination. These tubercles were placed very thickly near the scar, gradually becoming fewer as the scar was left. In one of the men the trouble extended from the finger to the forearm, and there was some evidence of tuberculosis even at the muscular attachment of the tendon. In the second case the tendon was attached to the sheath and the disease limited to an area ten centimeters in length. Examination of the removed tissues proved the presence of tubercle bacilli. Both of these men had good family histories, and were free from tuberculosis elsewhere, so that Doctor Mueller has no doubt that they were inoculated with bovine tubercle bacilli.

It would seem that instances of infection through wounds are not as uncommon as has been supposed heretofore. Their value has been questioned on the ground that inoculations do not always correspond to natural infections. I do not pretend that such cases settle the whole question definitely, but they do prove beyond question that there is no peculiar quality in the tissues of man which makes him an unfit soil for the bovine tubercle bacillus. Furthermore, they afford us means of comparison with similar cases in which the invading organism is of human origin, wounds of the hand while operating on tuberculous cadavers, or in cleaning cuspidors used by phthisical persons, being not uncommon. I have been at some pains to study the reports of such infections, and feel bound to conclude that the bovine bacillus is at least as virulent as the human for man when introduced in such manner. We know from experimental as well as clinical evidence that the skin is the tissue most unfavorable to the growth of the tubercle bacillus. If, then, the bovine bacillus can successfully invade the skin and multiply there, with the production of characteristic changes, it seems we are fully justified in believing that organs and tissues that are known to offer favorable soil to the human bacillus will also prove favorable to the bovine organism. On the other hand, I know of no animal which is susceptible to the human bacillus yet immune to the bovine. Birds are equally refractory to both, a small proportion of those inoculated or fed with either succumbing to tuberculosis.

Koch bases his opinion as to the non-transmissibility of bovine tuberculosis to man largely on the alleged rarity of primary intestinal tuberculosis. He says: "If the bacilli of bovine tuberculosis were able to infect human beings many cases of tuberculosis caused by the consumption of aliments containing tubercle bacilli could not but occur among the inhabitants of great cities, especially children. That a case of tuberculosis has been caused by aliments can be assumed with certainty only when the intestine suffers first, *i. e.*, when a so-called primary tuberculosis of the intestine is found." He says that he has seen only two such cases; that at the Charite Hospital in Berlin only ten cases were seen in five years; that among nine hundred and thirty-three cases of tuberculosis in children at the Emperor and Empress Frederick's Hospital for Children, Baginsky never found tuberculosis of the intestine without simultaneous disease of the lungs and bronchial glands; that Biedert found only sixteen cases of primary intestinal tuberculosis among three thousand one hundred and four children examined post mortem.

The assumption that the proportion of tuberculosis caused by food is correctly revealed by the lesion of the intestine or mesenteric glands is certainly erroneous, and leaves out of consideration entirely at least one very important avenue of infection.

The numerous observations made of late years leave no doubt that the tonsils sometimes act as the port of entry for the tubercle bacillus. As well put by Baup, "discussion is only possible as to the greater or less frequency of these lesions and their pathological importance," a position sustained not only by the work of other observers, but by his own, in which he examined the tonsils from those cases only in which tuberculosis of the lungs was absent and other ports of entry could be excluded. Dieulafoy, by the inoculation of guinea pigs, found tuberculosis in fifteen of ninety-six cases. Latham, who was careful to employ only the interior portions of the tonsils, in forty-five consecutive cases of children from three months to thirteen years of age, seen at autopsy, found seven which were tuberculous. One of the most recent studies of this subject is that of Friedmann, who examined the tonsils obtained from ninety-one children at autopsy, and fifty-four cases removed by operation, all but one of the latter under five years of age. Of the ninety-one cases, in three there was tuberculosis, probably not primary; in five there was tuberculosis, probably primary, with secondary involvement of lymphatic glands, intestine and bone; in one the tonsils showed many tubercles, giant cells and tubercle bacilli, the rest of the body being free; in seven (two and five without tuberculosis in other parts of the body) the tonsils contained typical giant cells, but no bacilli could be demonstrated; in three, giant cells attributed to other causes were found; in eleven, which showed extensive tuberculosis of other parts of the body, the tonsils were free, but showed scars; in four the tonsils were free, there being tuberculosis of the internal organs; in three bacilli were demonstrated in smear preparations, though no tubercles were found. In the remaining fifty-four cases tuberculosis was not found in any part of the body. Only one of the operative cases showed primary tuberculosis.

When we remember the frequency with which children are fed, and the ease with which particles of food lodge in the tonsils, we cannot but think that Friedmann is reasonable in his conclusion that tuberculosis of the tonsils is quite common in children, and that the infection takes place directly from food and not through the lymph, blood, nor by inhalation.

Numerous authors who have studied this question give corroborative facts, lack of time preventing further citations.

The number of cases in which infection can be traced to the consumption of tuberculous milk is not large, and almost all of them are open to some criticism from the fact that all other sources of infection cannot be positively excluded. From the nature of the case this will always be true, and we can never shut children up and feed them with tuberculous milk in the way of an experiment. However, evidence in some of the cases is so clear that Nocard has well said, "It has almost the value of an experiment," and it is quite sure that we would unquestioningly accept evidence of much less value if any other disease than tuberculosis were concerned.

Klebs and Rievel have recently reported two cases which came under the observation of the former. A healthy young man employed by Klebs to assist in making some investigations on milk infection had the habit of drinking the milk of the tubercular cows used in the experiment. In a few months he died of miliary tuberculosis. The second case was one of six male children who died at the age of two years of tuberculosis of the cord and meninges. This child was the only one of the six fed on cow's milk, and the only one that developed tuberculosis.

The reports of pathologists based on autopsies prove conclusively that in a certain proportion of persons dying of tuberculosis, and especially in children, the infection takes place through the intestine. As to the frequency of infection by this route there is a wide divergence of opinion, due partly to the fact that this method of infection is much more common in some localities than others, owing to local conditions, and partly to the interpretation given to the post mortem findings. Our method of determining the portal of entry is not entirely satisfactory, as is shown by the large number of cases reported by many pathologists in which it is impossible to locate the primary lesion.

In general the determination of the primary lesion is based on the belief that lymphatic glands in children give evidence of the duration and extent of tubercular disease in the organs with which more advanced caseation than mesenteric; the infection is put down as being through the respiratory tract. The fallacy of this has, I think, been demonstrated as regards infection through the tonsils, and that it is correct, even when the absorption takes place through the intestinal mucosa, is open to question. During intestinal digestion there is a constant current from the intestine to the mesenteric glands, and thence up the thoracic duct into the venous circulation. Any tubercle bacilli which may have gained entrance into this stream are carried almost immediately into the lung, and deposited there by election.

In our work at the laboratory of the State Live-stock Sanitary Board we have often been struck by the extensive involvement of the lungs in animals infected by feeding, and the slight injury of the intestines. Indeed, in some animals it has been impossible to detect any involvement of the intestine at all. I will pass you two cuts, one from a cow which was fed with bovine tubercular material. Both lungs were involved and had cavities in them. The bronchial glands were enlarged and showed small nodules. The mediastinal glands were enlarged and softened, but showed no nodules. The mesenteric glands were normal, and no lesion of the intestinal wall could be found. The second is from a monkey fed with a pure culture obtained from the mesenteric gland of a child. Both lungs were involved throughout and to a much greater extent than the abdominal organs. The bronchial glands were enlarged and caseous. In the intestine only one point of injury could be found, and most of the mesenteric glands were normal in size, and showed a few nodules one millimeter in diameter. Three glands associated with the upper intestine were much enlarged and showed caseation, though not more advanced than what was seen in the bronchial glands.

The specimens from the monkey illustrate another important point, namely, the occurrence of coincident infection through the upper part of the digestive tract and the intestine. If this animal had been examined without the knowledge of its history it would almost certainly have been put down as one of those cases in which the avenue of infection could not be positively determined. The lungs showed much more extensive disease than any of the abdominal organs, and the bronchial glands showed caseation, as well as some of the mesenteric, and to an equal degree. This monkey was tested with tuberculin before the experiment began, and was in perfect health when the feeding with tubercle bacilli commenced. The key to the situation lies in the enlargement and caseation of the cervical lymphatic glands, indicating an infection through the tonsils or some neighboring part of the upper digestive tract, though no lesion could be detected. We have here an undoubted food tuberculosis, yet the respiratory tract shows the chief involvement. Does not the same thing occur also in children, and more often than we suspect?

With these facts in view it seems not impossible that an infection gaining entrance through the intestine may appear first in the lung and thus be erroneously attributed to the respiratory tract.

On one point all pathologists, as well as clinicians, seem to agree, that in children tuberculosis shows a marked tendency to become generalized, and this occurs with such rapidity that it is often impossible to decide where the infection gained entrance.

The post-mortem statistics are gathered mainly from hospitals and asylums for children, and it is in children that we have most reason to fear infection by food, their diet consisting as it does so largely of cow's milk. The tremendous mortality of children from tuberculosis has forced us to pay particular attention to the study of the factors at work in early life, and a number of interesting and valuable analyses of autopsy records have been published. From England we get the most positive evidence of infection through the intestine and the most striking proofs of its frequency. English pathologists are practically unanimous in regarding the intestine as a frequent path of infection, the primary lesion being associated with this tract in about twenty-five per cent of all cases. We may examine the figures given by some of the more recent writers on this point.

Carr examined one hundred and twenty cases at the Victoria Hospital for Children, London. Of these, in eighty-two the disease was generalized in the sense that the lesions in different localities seemed to have a "common simultaneous origin from some infective center, or else that there were several quite independent tuberculous centers in different parts of the body." In seventy-nine cases the primary lesion was in the lung or bronchial glands; in twenty cases in the intestine or mesenteric glands; in six cases it was impossible to tell whether the respiratory or the digestive tract was first involved; in eleven cases widely separated caseous foci were found, and the primary lesion could not be located; in four cases no centers could be found, the lesions being generalized.

Guthrie at the Children's Hospital, Paddington, London, examined seventy-seven cases. He considered that in forty-two cases, or 54.5 per cent, the primary lesion was in the respiratory tract; in nineteen cases, or 24.6 per cent, it was in the intestinal tract. Of the remaining sixteen cases, the thoracic and abdominal organs were equally affected in seven; in six the origin was unknown, and in three otherwise accounted for. In only thirty-two cases could the origin of the tuberculosis be traced with certainty to the glands, to the thoracic seventeen times, and the mesenteric fifteen times.

German statistics, as far as I have been able to obtain them, do not sustain Koch's position, although they indicate that primary intestinal tuberculosis is not so common in that country as in England, which we would hardly expect, considering the precautions prescribed in Germany and the lack of regulations in England.

However, intestinal involvement in children appears to be quite frequent in most parts of Germany; and as many of the reports do not clearly indicate the primary seat of invasion, we are justified in believing that a fair proportion of these cases are due to intestinal infection. For example, the statement given by Koch and attributed to Baginsky—that among nine hundred and thirty-three cases of tuberculosis in children he never found tuberculosis of the intestine without simultaneous disease of the lungs and bronchial glands—is entirely indefinite as to the primary seat of the disease, and as quoted furnishes no ground whatever for Koch to stand on.

Against the figures given by Koch—which are confined to his own experience—the reports of Baginsky, and a series of cases attributed to Biedert, we have the statement of Professor Hueppe that "the number of these cases (primary intestinal tuberculosis) occurring in children is by no means so small as Koch alleged. The number of cases may be fairly reckoned as between twenty-five and thirty-five per cent of all deaths of children from tuberculosis."

Among fourteen children who died from other diseases, and in whom the existence of tuberculosis was not recognized before death, Kossel found tuberculosis of the bronchial glands ten times, and of the mesenteric glands four times. In twenty-two children who died of tuberculosis, he found the disease confined to the intestinal tract in only one case.

It is unnecessary to quote further statistics on this point. The extent of intestinal tuberculosis varies in different countries and in different parts of the same country—a fact which of itself indicates a local factor, such as the greater or less prevalence of tuberculosis in cattle. One cannot study such statistics as those given without being fully convinced that a very important proportion of the children who die of tuberculosis are infected through their food, and that the report made to the council of the British Medical Association was justified, namely, that "the mortality from tuberculosis in early childhood is not decreasing as it is at other ages in the United Kingdom, and the opinion that this great prevalence of the disease in childhood is due to infection through the alimentary canal by milk from tuberculous cows appears to be well founded."

It is well known and so universally acknowledged that tuberculosis is a widespread scourge in cattle that it would be superfluous to give an array of figures showing the extent of its ravages in various countries.

There has been and is considerable discussion as to the stage of the disease at which a tubercular cow becomes dangerous through the passage of tubercle bacilli in her milk. Some authorities hold that there must be actual disease of the udder for this to occur, while others believe that this is not necessary. As early as 1893 Dr. Theobald Smith showed that the tubercle bacilli may be found in the milk of tubercular cows when the udder, so far as the naked eye could tell, was free from disease. In a series of experiments at the laboratory of the State Live-stock Sanitary Board of Pennsylvania, the mixed milk of five cows was examined by intraperitoneal inoculation of guinea pigs. These cows had reacted to tuberculin, but were in good condition and of fine appearance. Repeated examinations of the udders by several veterinarians failed to reveal any lesion, and examination after death of the animals gave the same negative results. No attempt was made to concentrate the bacilli; on the contrary, the whole quantity of milk was well shaken, in order to imitate as nearly as possible natural conditions, and moderate doses of milk (ten cubic centimeters) were used. Of eighty-eight guinea pigs employed in this test, sixty-three lived long enough for the development of tuberculosis, and of these ten or 15.8 per cent became tubercular.

More surprising and more unusual are the results of Rabinowitch and Kempner, who inoculated the milk of fifteen cows into guinea pigs, the experiment being made to determine whether or not the milk of cows having a tuberculosis which could be detected only by tuberculin, and not by physical examination, might be virulent. Three examinations were made by a veterinarian in the course of the experiment. Of the fifteen animals ten were found to give virulent milk, a percentage of 66.6. One cow gave milk which contained a yellowish, gelatinous material, and caused a fatal peritonitis of all animals inoculated. Leaving this out, the positive results amount to 71.4 per cent. All of the cows had reacted to tuberculin, but none showed clinical evidence of udder disease when the experiment began. Of the ten giving virulent milk three showed advanced general tuberculosis, but no disease of the udder; two showed no evidence of disease at all, and one only on the second and third examinations. One cow had rales at time of first examination, but these disappeared, and she showed no evidence of disease after. On post-mortem one cow was found to have tuberculosis of the udder, and one showed clinical evidence of it on the third examination, made six months after the experiment was begun. The authors conclude:

"Milk may contain tubercle bacilli, first, in the beginning of tuberculosis without discoverable disease of the udder, and second, in latent tuberculosis that can be detected only by the tuberculin reaction;" also, "milk from cows that react to tuberculin must be suspected of being infectious in every case."

With these results before us we must admit that while tuberculosis of the udder is the most dangerous condition, we cannot by any means regard the milk of cows with general tuberculosis, but the udders of which are free from disease, as being safe for food. We must insist that danger is not limited to those herds which harbor one or more cows with udder tuberculosis. I cannot agree with those writers who attempt to belittle the dangers to which milk-fed babies are exposed by pointing out the comparative infrequency of tuberculosis of the udder. Dilution with the milk of other cows free from tuberculosis no doubt lessens the danger, but does not remove it.

The evidence at hand forces us to conclude that human and bovine tuberculosis are but slightly different manifestations of one and the same disease, and that they are intercommunicable. Bovine tuberculosis is, therefore, a menace to human health. We are not in a position at present to define positively the extent of this danger, but that it really exists cannot be denied. In the past there has probably been a tendency to exaggeration; however great this may have been it does not now justify any attempt at belittling the risk, and it is folly to blind ourselves to it.

The eradication of bovine tuberculosis is amply justifiable from a purely economical standpoint; viewed in its bearing on human health it becomes a public duty.

Discussion by Dr. D. D. Grout, Waterbury, Vt.

I wish simply to say that this is a subject that has interested me vastly. I have gotten my knowledge by reading and some by autopsies on diseased animals. I want to say that I have n't listened to anything for years that, from beginning to end, every word, every action, has absorbed my attention and I could say amen to as I could to the address just listened to. If I was in my usual physical condition, I should like to amuse you for a few minutes, but what is my loss is your gain.

Discussion by Mr. J. B. Hall, Franklin, Vt.

Just a thought: I am afraid we are taking one side of the question. Let us give the cow a chance. How many of our herds have become infected through human beings? How many farmers will hire a man who is too sick to work anywhere else, and how many farmers will hire a man with a chronic cough? How many times do we keep our cattle in unventilated barns, and how many times do they become affected? It was my good fortune to have my herd tested twice, and they were all right. Then I bought seven cows that were not tested. After a little spell, my herd began to show symptoms of the disease; we said those cows brought tuberculosis to my former herd. We examined them and could find nothing in them. My belief is that it was brought by human beings. I am not satisfied that the herd has been cleansed up in good shape yet. I changed farm help a year ago, and among the children was a delicate boy; he was quite indisposed, and at the end of three months he had tuberculosis. I don't think he took it from the cows; anyway I dismissed that boy. I say give the cows a chance, and if we quarantine cows infected with tuberculosis, I say let us quarantine men and keep them out of the barns.

Discussion by Mr. C. J. Bell, Walden, Vt.

I simply ask to be excused. I came in this afternoon to listen to what might be said on this subject, and I very much appreciate the remarks of the gentlemen. I can, like Doctor Grout, say amen to all that has been said. I am not a scientific man and cannot discuss this question as the doctors or members of boards of health can, but I do believe that from what I have observed as a member of the cattle commission that at least it is n't good taste for us to consume too much milk, as was suggested by the gentleman just addressing you. We can trace incidents where we are sure milk has done more injury than good to both children and older people. I do not believe that Vermont as a dairy state can afford—neither does she want to—to continue the use of unwholesome milk. Everything we do in our agricultural pursuits should tend to health and prosperity. The cost of the matter is frequently being brought before you. Now you should work carefully and honestly in getting rid of the scourge that has come to us. We should use careful methods in every way possible that we may furnish to the consumer the proper milk and butter.

I am told that the present board of cattle commissioners are doing a grand work in getting rid of tuberculous herds in Vermont. I judge the time is not far distant when we can boast that our herds are almost free from tuberculosis.

I very much appreciate the remarks given us and I trust that you as members of the State Board of Health and town officials will do all in your power to assist in getting rid of the germ which must be gotten out of our dairy produce. I thank you for your attention.

Discussion by Mr. E. Hitchcock, Pittsford, Vt.

I should be doing an injustice to myself if I did not take time to express my appreciation of the paper which we have heard this afternoon. It is always interesting to listen to a man who is well posted on this subject. It is an additional pleasure to listen to a man who has himself contributed so much to mankind in research work.

The danger of infection by inhalation has been exaggerated a great deal. There is no question but that a large proportion of cases of tuberculosis in human beings is caused by inhalation of these germs, but many of these cases of pulmonary tuberculosis have been attributed rather to eating than inhaling these germs.

I have seen stables where the air must have been completely loaded with these germs. If there is any great danger from inhalation, we should have found some cases of pulmonary tuberculosis among the stable attendants, yet we do not find very many of such cases.

It seems to me that there is a great work for sanitary workers in this direction, to ascertain what is the source of infection of this disease. But as to the stamping out of the disease, there are two ways which are clear to my mind: A great many have boasted that the slaughter of cattle was uncalled for. It is not necessary in order to stamp out the disease that every animal should be killed, but the practical question is, Is n't it, of the two alternatives, the most business-like way to do the business? What is the other alternative? It is the practical, absolute quarantining of every infected animal; it means that every animal which responds to the tuberculin test should be quarantined. It means an expense to the owner of the animal, a burden which no dairyman likes to undertake. It means separate stables, yards, separate pastures, separate feeding utensils, and watering places; but so far as the general danger is concerned, the only alternative is to get rid of the infected herd. Every man who opposes the slaughter of his herds should be compelled to point out some substitute for the method of stamping out this dangerous and widespread disease.

I wish to congratulate you on the valuable papers which you have had here.

THE PLACE OF THE SANATORIUM IN THE PREVENTION AND TREATMENT OF TUBERCULOSIS.

BY S. A. KNOPF, M. D., NEW YORK.

Gentlemen:—

So vast a subject as my title indicates cannot with ease and completeness be treated in one lecture, and I have to ask your indulgence for presenting certain facts only in a fragmentary way. Let me begin by explaining to you why I prefer the word sanatorium to the word sanitarium, and define the word at the same time. Sanatorium comes from the Latin *sanare,* to heal, and seems to me to be the exact equivalent to the German word "Heilanstalt" ("healing institution"), the name used by Hermann Brehmer when he created the first German establishment exclusively devoted to the treatment of pulmonary tuberculosis. The word sanitorium, though often used, does not rightly exist in any language. The word sanitarium, taken from the Latin word *sanitas,* health, indicates a health resort where people go for recreation, but usage in this country has preferred this term to designate an institution for the treatment of nervous and mental diseases, or for the cure of alcoholism or the drug habit. It is with great satisfaction that I am able to state that the United States government has, in spite of some opposition, accepted the word sanatorium for its two institutions for the treatment of consumptives. The state institution at Rutland, Massachusetts, has also adopted the sanatorium, and the institution founded in honor of the great physician, Alfred Loomis, at Liberty, New York, has recently changed its name from

Loomis Sanitarium to Loomis Sanatorium. We would like to see the word sanatorium always used to designate an institution devoted exclusively to the treatment of patients suffering from pulmonary, laryngeal, or other forms of tuberculosis.

I can only touch briefly on the history of sanatoria. In justice to our English brethren let it be known that we owe to them the first idea of the modern sanatorium treatment for consumptives. In 1840, George Bodington, of Sutton Coldfield, Warwickshire, England, wrote an essay on "The Cure of Pulmonary Consumption on Principles, Natural, Rational, and Successful," in which he insisted on the importance of a general diet, fresh air day and night, "together with systematic arrangements with regard to exercise and general treatment, and the watchfulness daily—nay, almost hourly—over a patient of a medical superintendent."*

Whether or not Hermann Brehmer of Germany got his ideas from Bodington and his English contemporaries, McCurmack and Bennett, is immaterial; to him belongs the credit of having made the successful hygienic and dietetic treatment of pulmonary tuberculosis known throughout the civilized world. His thesis for the final degree (1856) "Tuberculosis primis in stadiis semper curabilis," was characteristic of his life's work. Brehmer's early career was full of disappointments. He could not get the authorization to open an establishment for the exclusive treatment of tuberculous patients until after years of struggle against overwhelming opposition. His democratic ideas were not favorably looked upon by the Prussian government, and it was only through the powerful influence of his distinguished friends, Humboldt and Schönlein that he received at last, in 1859, the authorization to open his sanatorium. Brehmer's Sanatorium proved to be a great success; through it he attained fame and wealth. His contributions to the literature of modern phthisiotherapy are numerous and valuable. His many admirers, pupils and patients recently unveiled a monument erected to his memory at Goerbersdorf, the place he made famous by the thousands of cures accomplished in his sanatorium. From the picture which I will show you later you will see that Doctor Brehmer's was a striking face; he was imposing, energetic, with a beautiful head, broad shoulders, and a patriarchal beard. He knew how to inspire his patients with implicit confidence. Brehmer, though most fortunate in his enterprise, was not privileged to enjoy the satisfaction of seeing sanatoria erected all over the world, where his precepts for the treatment of consumption are now eagerly followed. His most distinguished pupil and co-worker, Dr. Geheimrath Dettweiler, has somewhat modified Brehmer's treatment by instituting more particularly the rest cure. He is still at the head of the institution at Falkenstein.

Of the personality of Geheimrath Dettweiler, whose picture I shall likewise have the pleasure to show you, I am fortunate enough to be able to say something from personal experience, because it has been my privilege to serve under him as assistant in his celebrated institution. That the personal equation is a very important factor in the success of the modern phthisio-therapeutist is certainly demonstrated by the life of Professor Dettweiler. He was a consumptive for years, but has cured himself by his own rigorous measures. He has overcome obstacles of which only those who have come in close contact with him are aware. In spite of inward suffering caused by the unfortunate chronic mental disease of a beloved wife, the great man has learned to show a cheerful face to all his patients and at all times. Yet I do not believe there are any sanatorium directors more strict in the management of disobedient patients, or more severe when one willfully violates the rules of the institution than Dettweiler, and he makes no distinction between high and low in this regard. It was during my stay at Falkenstein that this great physician politely, but in unmistakable, plain language, told a distinguished countess that she would no longer be allowed to walk in the sanatorium corridors, or grounds, unless she would prevent her trailing skirt from doing the work of the scavenger. The countess afterwards appeared in the sanatorium in a rainy-day skirt.

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* "The King's Sanatorium," by Arthur Latham, M. D., *Lancet*, January 3, 1903.

Dettweiler's greatest contribution to the system of modern phthisiotherapy is, as has been said, the rest cure in the open air, the "Dauerluftkur" in German. He has also made unceasing efforts on behalf of sanatoria for the poor.

The pioneer of the sanatorium movement in our own country is, as you all know, that good and great physician Edward L. Trudeau of Saranac Lake. Those of you who have come in contact with his charming personality, or who have followed his wonderful career, will gladly join with me in paying tribute to him. Nearly twenty years ago Doctor Trudeau was sent as a dying man to the Adirondacks. He suffered from pulmonary tuberculosis, but he did not die. He cured himself and began to cure others. From one poorly furnished cottage, with himself as first patient and first doctor, there has arisen, thanks to his broad humanity and the humanity of the friends he could interest in the cause, one of the most interesting, flourishing and successful sanatoria of the world. There are now no less than twenty-two cottages, accommodating from three to five patients each, grouped around a beautiful administration building with an adjoining infirmary. The remarkable results which Doctor Trudeau has obtained in the treatment of consumptives are well known throughout this country. I believe, however, that relatively few American physicians know of the patient and painstaking work which is done in the little, but most excellently equipped Saranac Laboratory for the Study of Tuberculosis, of which Doctor Trudeau is the able director. This laboratory originated in a very small room in his own house, in 1884; with a homemade thermostat, heated by a small kerosene lamp, he succeeded in growing the tubercle bacillus, and began to experiment on the infectiousness of sputum. But one day the kerosene lamp exploded and house and laboratory burnt to ashes. A friend and patient of the doctor's built him another laboratory that cannot burn down. The two pictures which I shall show you are evidence of the generosity and gratitude of this patient.

Among other American phthisio-therapeutists who have done pioneer work I must not fail to mention Dr. Vincent Y. Bowditch, and Dr. Charles S.

Millet, of Brockton, Massachusetts, who created the first sanatoria near large cities. Doctor Bowditch demonstrated the feasibility of treating consumptives successfully by the sanatorium method near Boston at a very moderate elevation, and Doctor Millet succeeded with a sanatorium erected in typical New England climate, virtually at sea level.

After this brief historic review let us rapidly pass to our main subject, "The Place of the Sanatorium in the Prevention and Treatment of Tuberculosis." The first and most important achievement of the modern sanatorium for the treatment of consumption has been to change the pessimistic view which our fathers and forefathers in medicine and many of us had concerning the prognosis of pulmonary tuberculosis. We used to fold our hands and content ourselves with giving cough mixtures and codliver oil, and let the patient do as he pleased, thinking that anything else would be of no avail; but the sanatorium treatment has revolutionized our conception of the prognosis, prophylaxis and treatment of phthisis pulmonalis.

Every conscientious practitioner to-day strives to discover a pulmonary tuberculosis in the earliest possible stage. He knows that the sooner it is discovered and treated the better is the prognosis. But the conscientious family practitioner will not only seek to diagnose an early case and institute the best possible methods of treatment, but he will also inaugurate such prophylactic measures as will protect the other members of the family from infection and the patient from reinfection.

In a modern well-equipped and well-conducted sanatorium for the treatment of consumptive patients, the prophylactic and curative measures should be almost ideal. The sanatorium will take the highest place as a factor in the combat of this disease when it serves as an institution for the treatment of tuberculosis as a disease of the masses, and the one so situated that it cures the largest number of consumptives is the one which bestows the greatest benefit to the community, to the nation, and to humanity at large.

Where can we find the right climate, the right altitude, and the desirable topographical conditions for such an institution? I hope you will not consider me too much of a heretic to the teachings of our fathers who believed in climate as an important therapeutical agent, when I declare that the necessary climatic and topographical conditions for the successful sanatorium treatment for consumptives can be found in nearly every state of the Union. A moderate elevation, varying from three hundred to one thousand feet, good, porous soil, if possible a site surrounded by woods, with southern exposure, and protected against the coldest winds, not too near to other habitations, and provided with good water, is to my mind all that is requisite for the establishment of a sanatorium.

While I do not underestimate the value of climatic conditions, such as continued dry weather, warmth and much sunshine, obtainable in some of our Southern and Western resorts, I do not consider these conditions absolutely necessary. I have been so often misunderstood and misquoted concerning my views on climate, particularly by confreres in some of the climatic resorts, that I desire to repeat here what I said in my recent article on

Tuberculosis in the "Twentieth Century Practice of Medicine"*: To my mind the best climate for a consumptive is the one where the ærotherapeutic portion of the combined hygienic and dietetic treatment, as understood to-day by the modern phthisio-therapeutist, can be carried out most easily and most persistently; or, in other words, the best climate for a consumptive is the one which permits him to go outdoors the oftenest and remain there the longest at a time. But since an ideal climate cannot be obtained everywhere, and will not be within the reach of everybody, the best thing to do is to get as near these conditions as possible, and preferably at not too great a distance from home. I lay stress upon the words *at not too great a distance from home.* Nostalgia, or if you prefer the good old English word, homesickness is a factor with which we have to reckon when dealing with consumptives. To be occasionally visited by his loved ones adds to the peace of mind of the consumptive and makes him more hopeful and cheerful. Homesickness, on the other hand, will always act as a depressing factor.

I have already said that places with moderate elevation and the concomitant requisites abound in nearly all our states. But to emphasize still more the necessity, and I might almost say, my preference, for sanatoria near our large centers of population in nearly all our states, let me say that the majority of the consumptive poor of which the public sanatorium has to take care, come from the laboring classes, and they should be treated and cured, if at all possible, in the same or nearly the same climate where they will have to live and labor after their restoration to health.

Lastly, one more point relative to the durability of cures obtained in different climes. I know from personal observation of a number of cases that cures of pulmonary tuberculosis effected in our home climates, which are, in general, not considered as especially favorable to this class of sufferers, have been more lasting and more assured than cures obtained in more genial climes away from home. In these observations I do not stand alone, for such men as von Leyden, Gerhardt, von Ziemssen, Dettweiler, Naunyn, Frankel, and Walthers have had the same experience.

Dr. Lawrason Brown, house physician at Doctor Trudeau's Sanatorium, in a most interesting article which appeared recently in "American Medicine"* demonstrated by carefully compiled statistics that neither sunshine nor dryness are necessary factors of gain in weight, but that, on the contrary, cold weather stimulates assimilation and gain in weight more than warmth. Doctor Millet, whom I mentioned above, established, some years ago, a little sanatorium at sea level in the town of East Bridgewater, Massachusetts, and found not only the atmosphere during the day, but even the much-feared night air of New England, most suitable for the treatment of consumptives all the year around.

It has been demonstrated that the sanatorium built near a large center of population, under ordinary climatic conditions, will obtain just as good average results as the one situated in what was formerly considered an ideal climate. It is, of course, understood that, in order to obtain these results, the sanatorium should be constructed and equipped according to the most approved method and be conducted in a most practical, scientific, and let me also say, humane manner.

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* Twentieth Century Practice of Medicine, Vol. XX., page 330, Climatotherapy, etc.

* "A Study of Weights in Pulmonary Tuberculosis; Based on the Weight Charts of Twelve Hundred Patients at the Adirondack Cottage Sanitarium."

Only in regard to the treatment of tuberculous diseases in children, and particularly in the treatment of that milder type of tuberculosis—"scrofulosis"—seacoast climate seems to be of particular advantage. Fortunately, our country offers so many seacoast localities suitable for the establishment of children's sanatoria that not a state would need to be without one if the government were desirous to establish such needed institutions. They will be desirous to do so if they realize that every child cured from scrofulosis means a life saved, and that, had it not been treated, it would have been likely to have succumbed to consumption. It goes without saying that these seaside sanatoria should have a staff of teachers attached to them so that the education of the little invalids may not be neglected.

After my lecture I will show you photographs of a number of American and a few European sanatoria for consumptives, and a few seaside sanatoria for scrofulous children. You will see there an endless diversity of construction. You probably expect me, and perhaps justly so, to give you my idea of what I consider the best type of a sanatorium for consumptives. If there is plenty of ground and plenty of money to erect and maintain, say from twenty to forty small cottages after Trudeau's pattern, for from four to five patients each, and besides that a large, well-equipped infirmary with from twenty to thirty separate rooms, and a large administration building in the center, such a plan is most excellent. However, the single cottage plan will perhaps prove too expensive for the majority of communities. The average daily cost per capita at Trudeau's sanatorium is $1.25. Secondly, such a plan is hardly adaptable, except under the condition that the majority of patients received are in the earlier stages of the disease, as it is the case in Doctor Trudeau's institution. To my mind it is utterly impracticable to constantly supervise patients in forty cottages, from twenty to fifty feet apart, when the inmates need the watchfulness and medical supervision essential to their treatment.

The one-house sanatorium, much in favor in Europe, where often from fifty to one hundred patients are placed under one roof, is to my mind not in accordance with our conception of modern hygiene. The large pavilion plan which accommodates from twenty to twenty-five patients in each pavilion, these to be connected with each other, with the central building and with the recreation pavilion, by covered passage ways, would seem to me best suited for a public sanatorium where economy and constant medical supervision enter as important factors in the successful management of all classes of patients. Later on I will show you some sanatoria which have been constructed according to this plan, and also a few ideal plans of sanatoria which have been elaborated by others and myself in connection with eminent architects.

As to the material to be used in the construction of a sanatorium, no matter on what plan, brick is always to be preferred.

It is sometimes not only necessary, but very advantageous, to have connected with the institution a little tent colony, where suitable cases can be treated often during a very large portion of the year. As to the construction of the tent, there is great diversity of opinion. What seems to me essential is that there should be a high wooden platform, good ventilation, and some arrangement to deaden the glare of the sunlight when such becomes necessary for the comfort of the patients.

The tent cottage devised by my friend, Doctor Holmes, of Denver, seems in many respects superior to those heretofore employed. The frame is of wood like that of an ordinary small wood building; the outside walls are boarded half way up; above this are two frames covered by canvas. The inner frame is so arranged that it can be lowered to the floor just inside the wall of the lower half of the tent. The outer canvas frame can be raised outward so as to form an awning. There is a space of four inches between the inside and outside walls. The outer canvas frame extends from the roof to within four inches of the wood portion, and the inner canvas frame extends to within four inches of the roof of the tent, so that even when, on account of storm or other reasons, the upper half of the walls of the tent are closed, there is a continuous circulation of air, entering just under the roof. This tent cottage combines the maximum of ventilation with the minimum of exposure to the weather. It is more comfortable and more easily managed than the ordinary tent. A door is placed at each end, and above the door two canvas windows swing on pivots. I shall illustrate to you a few such tents now used in the Phthisis Hospital on Blackwell's Island, New York.

Another excellent tent is the one devised by Professor Irving Fisher, of Yale, which is in many ways an improvement on the well-known "Sanatory Tent" invented by Doctor Gardiner. At my recent visit to New Haven it was my privilege to examine Professor Fisher's tent, and I am indebted to him for the excellent photograph which I shall take pleasure in showing you, and for the following description:—

"The object of this tent is to provide pure air to the occupant under all conditions of weather, without sensible draft. The essential idea is to force a gentle current of air vertically upward through the tent. The breath of the occupant naturally rises, and is then caught in this upward draft and carried out, so that there can be no possibility of its being rebreathed.

"The rapidity of change of air to effect this result need not be great. Ventilating engineers usually make a fundamental mistake in treating the problem of ventilation as though it were to add pure air to the room, whereas the principal problem is to remove the impure air. Ordinary ventilation simply dilutes this impure air instead of removing it systematically as fast as formed and preventing its return to the nose. The quantity of air passing through this tent is considerably less than what passes through an ordinary tent with horizontal air currents; but the air breathed by the occupant is absolutely pure, instead of slightly contaminated as it is in the ordinary tent.

"The tent floor is 10 x 14 feet, the walls of the tent are eight feet high under the eaves, from which rises a pitched roof to a central cupola which is 4 x 5½ feet in horizontal dimensions, and three feet in height.

"The tent is raised a yard above the ground. The air enters the space beneath the floor through louvre-boards or 'luffer-boards' of cloth, which are simply like clapboards hinged at the upper edges and hanging one over the other. These luffer-boards are hung at their upper edges by cords on the inside of a wire netting surrounding the base of the tent. Thus they open inward at the slightest wind pressure, allowing every breeze to enter the space beneath the floor, but not allowing it to escape, since the pressure from the inside against the 'luffers' closes them. The air is thus forced up through the tent. Similarly, the sides of the cupola are provided with luffer-boards of the opposite kind; that is, they are hung on the outside of a wire netting and yield to any effort of the air to escape from the tent, but close against any wind from the outside. The effect, therefore, is to produce 'wind-pump ventilation,' and to transform the slightest breeze into an upward current.

"Free passage of air through the floor is provided by a space three inches wide between the tent floor and the walls of the tent, and also by two slits two inches wide in the floor four feet from each end. These slits, as well as the openings on the four sides, may be closed by trap doors, so that the tent may be temporarily heated in the morning when the patient wishes to dress.

"The tent runs in an east and west direction. The entire south wall consists of curtains which roll from the bottom on Hartshorn rollers, and may be put down in the day time to sun out the tent, or on hot, close summer nights when the air is absolutely still. In cold weather, even when the air is still, the curtains need not be lowered, as the difference in temperature between the breath exhaled and the surrounding atmosphere is enough to cause the exhalations to rise and pass out of the cupola openings. To provide for this there is a small space above the luffer-boards in the cupola always open, and also above the luffer-boards around the base of the tent.

"One other device needs to be explained. This is a 'regulator' under the floor of the tent and in the center. It performs two functions: the first and most important is to distribute the air evenly to all four sides of the tent; the second is to check the motion of the air when it is excessive, as in a gale. A false floor of canvas is constructed a foot below the real floor, and in the center of this false floor is an opening 5 x 7 feet, covered with wire netting and provided with luffer-boards like those already referred to, but hanging from the wire netting at an angle of less than forty-five degrees. Half of them, namely, those toward the west, are hung at their west edges. The consequence of this arrangement is that the air passing through these luffers is distributed half toward the east and half toward the west, so that each end of the tent is supplied with its share of air, whatever the direction from which the wind is blowing. It is found that without this distributing apparatus the air is apt to come up on the side of the tent most remote from the direction of the wind, and even in some cases to produce a revolving motion of the air in the tent, causing a down current on the windward side. With the regulator, however, this never happens.

"In case of a gale, the luffer-boards in the regulator, which usually hang open, are blown shut and keep out an excessive quantity of air. The luffer-boards at the extreme east and west are lightest and close first. The weights of the remaining luffer-boards are graduated, so as to close successively in proportion to the severity of the wind.

"The wire netting to which these luffer-boards are attached is surrounded by canvas screens projecting seven inches downward from the false floor, so as to constitute a short shaft, as it were, thus compelling the air, before reaching the luffer-boards, to already have a general upward direction.

"The mechanism which has been described thus performs four functions:

"(1) The luffer-boards surrounding the base of the tent act like in-draft fans.

"(2) Those in the cupola act like a suction fan.

"(3) Those in the central opening in the false floor distribute the air evenly, and

"(4) Check excessive drafts.

"The result is that the tent automatically provides pure air for its occupants, without drafts, and in all conditions of weather, with the single exception of weather which is both hot and still, in which case it becomes necessary to lower the curtains.

"The tent has been put to several severe tests. A stove was placed in the center, with the stovepipe extending only a foot above the head. It was found that the smoke thus vented into the tent itself was all carried out through the cupola without even producing any odor perceptible to those in the tent.

"The tent is simply a combination of the main features of the Gardiner tent, devised by Dr. Charles F. Gardiner of Colorado Springs,* the Millet shack, employed by Dr. Charles S. Millet at his sanatorium at East Bridgewater, near Brockton, Massachusetts, and the movable cloth luffer-boards frequently employed by heating engineers in 'cold-air boxes.' The combination of these three devices avoids some of the objections which apply to the Gardiner or Millet structures.

"It is superior to the Gardiner tent in the following particulars:

"(1) One side can be made entirely open in still, hot weather or in the day time for the purpose of sunning the tent.

"(2) The slightest breeze is caught by the luffer-boards and forced through the tent.

"(3) There never can be a down-draft, as sometimes happens with the Gardiner tent when overtopped by a building or tree to the windward.

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*This tent is fully described by Dr. Gardiner in his pamphlet entitled "The Sanatory Tent and its Use in the Treatment of Pulmonary Tuberculosis."

"(4) There never can be a draft across the floor.

"The points in which the tent is superior to the Millet shack are:

"(1) The patient is not subjected to strong or variable winds.

"(2) He is not forced to sleep with the glare of the sky in his eyes.

"(3) There is no need of any adjustment by the patient at night in case of a storm or a change in the direction of the wind.

"*Some Details.*

"There is a double roof to prevent leaking.

"The luffer-boards in the cupola must be waterproof.

"All luffer-boards have the corners cut off obliquely, as the square corners will 'whip' and make a troublesome noise.

"The luffer-boards are tied by cords running obliquely downward. The cords must be loose enough to provide for shrinkage in damp weather, and yet tight enough to prevent the luffer-boards from fluttering in the wind.

"The false floor is made in sections easily detached and cleaned.

"The cupola and the window in the false floor are lined with mosquito netting.

"The curtains run between guides constructed of soft rope, so as to act as noiseless cushions. Cords from the curtains pass over pulleys at the northeast or northwest corner of the tent and thence to cleats on the east or west wall, so that the patient may operate the curtains without leaving his bed.

"The curtains must be so adjusted in length that when they are pulled entirely up the Hartshorn metal rollers have the slit downward; otherwise the rain will percolate inside the rollers and injure them."

The interior finish of the sanatorium building proper should, of course, always be with all corners rounded off, walls and ceilings covered with oil paint which can easily be washed, and the floors of hard wood. All the patients' rooms should preferably have a southern exposure. Windows being open day and night, the room will, of course, always be well ventilated. When it is severely cold and the room has to be heated, one window should nevertheless be at least partially open. A hot water system is perhaps the best method of heating, and all radiators should be so constructed that they will not become dust accumulators.

While, of course, a well-equipped sanatorium should have the best water supply, a perfect sewerage system, and protection against fire, there should be also a special hydro-therapeutic establishment and rooms for sun baths. I have become quite enthusiastic over solar therapy. The results obtained by exposing the nude body systematically to the rays of the sun, the head being always in the shade, are very satisfactory. Metabolism and oxygenation are increased thereby and the general condition improved.

To facilitate the open air and rest cure, it is often desirable to have special sheds or rest-cure galleries placed alongside the sanatorium buildings. Respiratory exercises should be carefully taught and if necessary supplmented by the pneumatic cabinet treatment.

No sanatorium for consumptives is completely equipped without X-ray apparatus for diagnostic purposes, dark room for laryngological work, and even appliances for electric-light baths. The kitchen, which should offer the best and most nutritious food to the patients, should be either on top of the administration building, or far enough removed from the rooms of the patients for the odors not to reach them.

Whenever the topographical situation permits it, graded walks with varying inclinations should be laid out. The infirmary, where the more seriously ill patients are kept, should be so constructed that each room would have either a veranda or balcony on to which the bed can be rolled and the patient remain there most of the day, and even the night, weather permitting.

The hygienic equipment of a sanatorium should be particularly directed toward the prevention of any possible infection from patient to nurse, physician or visitor, from patient to patient, and toward preventing the patient from reinfecting himself. I cannot offer anything new which is not known to all modern sanitarians. If you permit me, however, I will show you a few devices which may be helpful in preventing the spread of the germ from the expectoration of the pulmonary invalid, and from the expulsion of droplets of bacilliferous saliva, commonly known as drop infection.

For use in sanatoria, particularly in corridors and grounds, I would recommend an elevated spittoon which has numerous advantages over the ordinary spittoon placed on the floor. The latter is unsightly, may be tipped over, and usually presents on its rim or even on the outside dried sputum which did not reach the receptacle proper. Having no cover, these old-fashioned cuspidors allow animals and insects to get at the contents and thus help in the dissemination of the bacilli.

The stand of the elevated spittoon is three and one-half feet in height, and consists of iron tubing with a bottom plate, which can be screwed on to the floor or fastened to a sunken board when used out of doors. The large cast-iron base, however, is in itself sufficiently heavy to prevent the spittoon from tipping over. On top of this tube is a round box of sheet iron, with a door which can be tightly closed. Attached to this door is a ring in which rests a blue or white enameled iron spittoon. Thus, when the box is opened the spittoon is drawn forward and is ready for use. The top of the stand is provided with a rim to facilitate the placing of a flower pot or other ornament. These elevated spittoons, only visible when in use, by their convenient height and easy manipulation, make the deposit of the sputum into the cuspidor more certain than in the case where spittoons are placed on the floor.

A similar elevated spittoon stand can be made of wood, which would make it considerably cheaper. Instead of the metal spittoon, the large Seabury & Johnson pasteboard spittoon, which can be burned with its contents after use, may also serve with these stands by being suspended to the ring fastened to the door.

There are numerous other devices which might be used with advantage, for example, a wall cuspidor resembling a letter box. Where there is a plentiful supply of water, the elevated self-cleansing street spittoon which I devised for health resorts much frequented by consumptives may be advantageously placed in the grounds of a sanatorium. The automatic spittoon has the advantage of making an accumulation of sputum an impossibility.

When the patient is away from the sanatorium so that he has no access to a stationary cuspidor, a pocket flask of metal, strong glass, or pasteboard, should be used. There are many kinds of these in the market. I show you here a little model which, perhaps, answers all the requirements. It is oval in shape and can be conveniently placed in a pocket. It is about three and three-quarters inches in height, its longest diameter is two and three-quarters inches, and its shortest diameter one and one-half inches. The opening is round and has a diameter of one and one-half inches. A movable funnel prevents the contents from soiling the cover, acting on the principle of the irreversible inkstand. The flask is made of spring brass and is electro-nickel plated. Two seamless brass cups are welded together, forming the flask, to which the cover is firmly soldered and the funnel spun (seamless) with a flange fits exactly on the rim of the cup. The cover is closely fitted with an elastic rubber ring for the purpose of preventing leakage. There is a strong spring catch which serves for opening and closing, and the flask can be manipulated with one hand by pressing with the thumb against the opening spring and closing the cover with the index finger. By the aid of a wire hook the funnel can easily be removed and the flask emptied. By placing the flask in the center of a moderate-sized handkerchief, taking up the four corners and putting an elastic band around the neck of the flask outside of the handkerchief the cuspidor can be used without attracting any attention.

I also show you here a few other less expensive pocket metal flasks and paper spit cups and purses which may answer the purpose just as well. Some of these, such as the Dettweiler flask and its modifications, are made of blue glass.

For use at the bedside, sputum cups made of pasteboard, or of light metal, are most convenient.

There will always be some consumptives who cannot be persuaded to use the pocket flask, for the simple reason that they do not wish to draw attention to their malady. The only thing for these people to do is to use squares of soft muslin, cheese cloth, cheap handkerchiefs, or Japanese paper handkerciefs specially manufactured for the purpose, which can be burned after use. They should also place in their pockets a removable lining of rubber or other impermeable material which can be thoroughly cleaned. This additional pocket should be fastened to the inside of the ordinary pocket by clamps, and would thus be of no inconvenience to the patient. A pouch of vulcanized rubber, or an oriental tobacco pouch, may be used in place of the extra pocket of impermeable material.

The danger of dissemination of the bacilli through the so-called dry cough (drop infection) is relatively small; we should, however, insist that the patient hold a handkerchief before his mouth or nose when he coughs or sneezes. The consumptive should be advised to carry two handkerchiefs with him, one to hold before his mouth and to wipe it with after having expectorated; the other to use only to wipe his nose. By being careful with the use of his handkerchiefs, the danger of infecting his nose and bronchial tubes will be materially lessened.

To avoid drop infection while the patient is taking his rest cure in the open gallery, or when he is seriously ill in bed, specially devised screens of washable material are recommended. Such screens are in use in the celebrated people's sanatorium at Belzig, Germany, which is under the direction of Professor Frankel and Doctor Moller.

All soiled linens (sheets, pillow cases, underwear, napkins, handkerchiefs, etc.) used by the consumptive should not be handled more than necessary in the dry state, but should be placed in water as soon as possible after removal from bed or body. It is better to wash these articles separately, and only after having been thoroughly boiled should they be put with the common laundry.

Patients in bed and too weak to make use of any of the above mentioned sputum receptacles should be provided with moist rags to receive the sputum, and the nurse in charge should see to it that these are burned before they become dry. The most practical ways of destroying the sputum collected in the spittoons are either by burning or the sterilization by hot steam. The persons entrusted with the collecting and destroying of the sputum and the cleansing of the cuspidors should wear rubber gloves when handling the cuspidors, so that local inoculation becomes impossible.

Before we leave the subject of the care of the expectoration, let me call your attention to the great advantage which is derived from teaching the patients and those associated with them to take scrupulous care with the deposit of all sputum, not only in regard to tuberculosis, but also in regard to other infectious diseases. The physician and sanitarian knows now that the infectious sputum of pneumonia, which has a relatively greater mortality than tuberculosis, is doubtless an important factor in the propagation of this disease, and should we not take the same precautions concerning diphtheria, grippe, whooping cough, and measles? Individually, I cherish the hope that some day fashion will decree it to be good form to use a pocket flask or a piece of muslin which can be burned afterwards, when suffering from anything from the simplest cold to the severest type of grippe, or from any other disease which causes us to expectorate, or when simply desirous to get rid of an excess of saliva. In view of the fact that when in perfect health we not infrequently carry the micro-organisms which are productive of pneumonia and diphtheria, such precautions with our sputum, if carried out at all times and by all persons, must inevitably decrease the morbidity and mortality from all the above mentioned diseases.

We come now to a most important point, the conducting of a sanatorium for consumptives. Whether the institution be a private or a public one, a medical man should always be at the head. The general superintendent or manager looking after the business and general affairs of the institution should know that he is subordinate to the physician in chief. The number of assistants and nurses necessary for an institution will depend upon the number and class of patients, and whether the institution is built on the cottage, pavilion, or one-house plan.

The inmates of the sanatorium, no matter from what class they may come, will have to be treated with great discretion, and the true sanatorium physician must not only be the patient's medical adviser, but also his counselor and friend. The psychic condition of the consumptive is peculiar; at times he is sanguine to the extreme, at others morose; some are over careful, some criminally careless.

If the pulmonary invalid is of a particularly melancholic disposition, "suggestion therapy" will, of course, form an important factor in the management of the case. This will be especially needful when there is a consumptive family history, for I have learned how difficult it is to dissuade the patient from the preconceived idea that he has to die of consumption because some one in his family died of it.

The sanatorium physician should at all times be ready to give advice to the patient. Without making it seem obtrusive he should even offer his advice on all subjects of sexual relations, marriage, childbirth, etc. The physician of the sanatorium of the people can do a world of good in preventing the union of consumptive people and the procreation of offspring predisposed to tuberculosis. Gentleness, kindness and forbearance are qualities inseparable from the successful physician in every institution where the inmates come from all classes of society, and particularly from the lower classes. In one respect, however, there should never be any yielding on the part of the physicians or officers of the institution, and that is in case of voluntary disregard of the hygienic rules and regulations laid down for the protection of all the patients themselves and the protection of the employees, officers, and visitors.

All patients should be impressed with the idea that they are in the sanatorium for their own good, and that they must labor in order to get well. The physician must lay out a schedule for every patient to follow; at such an hour to rise, at such a time to walk, at such an hour douche, at such respiratory exercises, at such rest cure, at such meals. It is not at all impracticable, but on the contrary very desirable, in a people's sanatorium for the earlier cases to have each group or each pavilion select their own foreman or forewoman who sees to it that order is maintained, that the physician's directions are carried out, and the general rules of the institution obeyed. Such foremen, elected by the patients themselves for their peculiar fitness and character, will often render valuable service in conducting such a sanatorium.

In a sanatorium for the people, that is to say, mainly for the poor and those of moderate means, it has often been thought necessary for reasons of economy to have some of the convalescent patients help around the house, in the gardens, or fields. Again it has been thought desirable to occupy these patients for the sake of enabling them to pass their time. The amount and kind of work which such a convalescent person performs should, however, not be left to his own caprice, nor to the discretion of an orderly, or even nurse or general manager. The physician alone should determine the kind and amount of work the patient should do.

The question of occupation for the patient has always been a serious problem to modern phthisio-therapeutists. All agree that only the afebril patients should be allowed to do physical labor. Exciting games and even exciting literature should not be permitted to either the febril or afebril patient in a sanatorium. Gardening and light field work and such house and kitchen work as does not involve much stooping, excessive exercises or exposure to dust, may also be permitted in certain cases. I maintain, however, that the work which can be accomplished by the consumptives in a sanatorium receiving patients in all degrees of the disease will, perhaps, never amount to enough to reduce the force ordinarily employed for help in a sanatorium to any appreciable degree. Most of these patients should be busy all day with carrying out prescriptions for walks, breathing exercises, douches, sun baths, rest cure, etc., and consequently would have little time left for anything else. Only in institutions where incipient cases alone are received can the thought of self-support enter into consideration. Yet, we can do much in the direction of occupying nearly every one of our patients in the sanatorium with something useful to him and useful to the community at large. If the modern sanatorium stands for anything, it stands for education, an education particularly of the masses. Besides the practical training the consumptive receives in such an institution in regard to the care of his sputum, the care of his body, what to do and what not to do to improve his condition, he can be taught many things which, when he returns to his former environments, will make him not only a hygienic factor in his community, but let us also hope, a moral and intellectual example to be followed by his fellow-men.

Alcoholism, which is the curse of our nation, the curse of our poor and our rich, but which is particularly frequent among the laboring population, must never receive any encouragement in a sanatorium. Only in the rarest instances should alcohol be prescribed. We have learned to treat the vast majority of consumptives without it, and we should surely do so in a sanatorium into which so many enter with either a hereditary or acquired predisposition to drink. The physician in charge of such an institution can and should deliver a series of interesting lectures or practical talks on the evils of alcoholism and the dangers from excesses of all other kinds and on the hygiene of tuberculosis. The patient should not only be hygienically educated, but those who come from the masses of the people whose general education has often been seriously neglected, should find in the people's sanatorium an opportunity to acquire useful knowledge which may be helpful to them in their struggle for life when, restored to health, they return to their usual vocation.

My esteemed and distinguished friend, Dr. Hans Weicker of Goerbersdorf, conceived the brilliant idea of attaching to his institution a thoroughly trained schoolmaster, who, thanks to a classic and special university education, inaugurated not only most interesting lectures on such subjects as first principles in astronomy, physics, botany and zoölogy, but with the help of an asistant instructed also in stenography, typewriting, composition, grammar and arithmetic all those who felt the desire and the need of such special instructions. Think of the world of good which such a sanatorium could do. If I had my way I would have such a teacher in every sanatorium for consumptives where the poorer classes are received. And for the female department I would have a matron who could tell the poor women of the institution some things of practical cooking and economic and clean housekeeping and taking care of children.

Before leaving the question of occupation I must say a word concerning what is to become of the cured consumptive. If he has been a tailor in a sweatshop, a printer in an unsanitary printing office, a stone cutter, a cigar maker, a hatter, or has pursued some similar unhealthy occupation, shall we allow him to return to his former environments which had been such dangerous adjuncts in the development of the disease we have only just mastered? Surely not. I have repeatedly advocated, and shall continue to advocate, agricultural and horticultural colonies for cured consumptives in connection with people's sanatoria. This is for the purpose of making the cure more permanent and awaking in the former pulmonary invalid a taste for agricultural and horticultural pursuits; also, if possible, to induce him to settle permanently in the country. The forests, fields and gardens in the vicinity of the sanatorium may also help to teach the beauties of a closer touch with nature to the inmates who come mostly from crowded cities or towns. The problem of our overcrowded cities and deserted farms may be solved in a measure at least by people's sanatoria.

You see, gentlemen, what the possibilities are for a well-conducted sanatorium destined to treat the consumptives who come to us from the masses. As a healing institute we can cure there from fifty to seventy-five per cent. As an institution for isolation we remove a center of infection with every case taken from our crowded districts, or from a large family, while, if the patient were left in his usual environments, he would certainly cause new cases by infecting kin and neighbors. As an educational institution, it stands paramount as one which teaches every patient by practical training how to prevent the spread of consumption. He in turn will teach those with whom he may come in contact after having left the institution how to avoid becoming consumptive. The modern sanatorium for consumptives should, however, not only serve as an educator of the patient, but also as a means to instruct physicians. In Germany it is the custom for senior medical students to visit the sanatorium nearest their university a few times a year under the guidance of their professor of internal medicine, in order to learn there from personal observation the value of institutional treatment. We all know that it is often necessary for the general practitioner to institute the sanatorium treatment at home, and it is obvious that such visits to a well-equipped sanatorium, combined with a lecture by the sanatorium physician, will prove most valuable to the future family doctor.

There is another benefit to be derived from well-conducted sanatoria, which, to my mind, has not yet been sufficiently appreciated. I have repeatedly mentioned in my writings* and demonstrated through statistics that sanatoria for consumptives are not a danger to the neighborhood. In two German villages five of the most flourishing sanatoria have been in operation for many years, and the mortality from tuberculosis has actually diminished to one-third of what it was among the inhabitants of the surrounding villages. This was doubtlessly due to the villagers imitating the good cleanly habits of the sanatorium inmates. In our own leading sanatoria in the Adirondacks and at Liberty cases of contagion from patient to nurse or doctor are virtually unknown. This shows that the trained, clean and conscientious consumptive is as safe an individual to associate with as any well person. In other words, the sanatorium teaches that phthisis pulmonalis is only a communicable but not a dangerous contagious disease, and that phthisiophobia (the exaggerated fear of the presence of a consumptive) is as unscientific and unjust as it is cruel. The patient leaving the sanatorium will be our greatest help in the combat of this senseless fear of the presence of a consumptive, which of late has taken such alarming proportions.

If the teachings of the sanatorium have been as I have outlined them, the patient will leave the institution prepared not only to spread the true ideas of how to avoid the propagation of tuberculosis, but he will also have learned the fundamental principles of general hygiene and how to remain well and be happy. If his school education has been neglected or been insufficient, he has had an opportunity to improve upon it during his sojourn in the sanatorium. By example and teaching he will have learned the dangers of intemperance in all things, but particularly the dangers of alcoholism. The young girl, wife, or mother will have learned in the sanatorium not only how to keep the home as far as possible free from all infectious diseases, but she will also have been taught how to make it more attractive and how to bring up her children. These men and women should leave the sanatorium not only cured from their bodily ills, but also in a happy and hopeful frame of mind and better equipped for the struggle of life, with higher aims and noble ideals.

Finally, I shall say a word of the influence which sanatoria for the consumptive poor may exert, and have often exerted, on the hearts of the rich and mighty and on those of the poor and lowly. In European countries the royalty and the aristocracy of birth and finance have become interested in the establishment and maintenance of a large number of sanatoria erected for the consumptive poor. The emperors of Germany and Russia, the kings of England, Sweden Denmark, Spain and Portugal, the Queen of Holland, in short, nearly all the reigning houses of Europe, the President of France and the presidents of our southern republics have interested themselves in behalf of the consumptive poor by opening their private purses for the establishment of sanatoria, or have become protectors of sanatorium associations. But not only the hearts of the high, rich and mighty have been touched by the sufferings and woes of the consumptive poor; the meek and lowly, too, have contributed their mite to relieve the sufferings of those unfortunate ones, and nowhere, it seems to me, has this need of the poor been more generally responded to by the poor or relatively poor than in this country. In fact it grieves me to be obliged to make the statement that the rich Americans have up to this time with but very few exceptions shown a painful indifference toward our consumptive poor. The poor themselves, and people in moderate circumstances, seem to be more keenly alive to the necessity of making sacrifices in order to help consumptive sufferers. It has been my privilege to plead in various cities of our country for the establishment of institutions for the tuberculous poor. If I wished to relate all the pleasant and touching incidents connected with my work which prove the sympathy of the poor for the poor, I could write volumes. I shall tell you only of one: I had been invited by the physicians of Scranton, Pennsylvania, to address a public meeting for the purpose of arousing interest in the establishment of a sanatorium for the numerous consumptive poor of that city. At the close of my lecture I pleaded as earnestly as I could with my audience composed, as such audiences usually are, of ordinary trades people, physicians, school teachers, some laboring men, etc. Before the meeting adjourned the amount of $6,500 was raised by subscription. This was indeed gratifying to the promoters of the meeting and pleasing and encouraging to me, but my heart was touched to a deeper degree, my faith in the goodness of mankind sublimely strengthened, when two days later I received a letter from Doctor Wainright, who had been in charge of the meeting, which read as follows: "My dear Doctor Knopf:—You may remember my telling your audience the story of the young mechanic who begged so piteously that his consumptive wife, the mother of six children, might be taken care of. He came into my office to-day and said: 'I was at Doctor Knopf's lecture and heard about the new sanatorium, so I collected some money for you among my shopmates.' Then he handed me $31." Here is an instance where a few hard-working laboring men came generously to the rescue, hoping thereby to save the life of the wife of one of their comrades. Let us trust that the sympathy for our consumptive friends among the poor will also reach to our rich and usually very generous fellow citizens, and that as in Europe, in Canada, and in the southern republics, the high officials of our beloved country, our honored President, the governors of states, mayors of cities, will take an interest in the combat of this dreaded disease of the masses, a disease so eminently preventable by sanitation, better housing and the general education of the people; a disease so eminently curable, but of which many thousands of our American fellow citizens must now die annually because there are not enough places to cure them.

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* "Pulmonary Tuberculosis: Its Modern Prophylaxis and the Treatment in Special Institutions and at Home." P. Blakiston's Son & Co., Philadelphia, Publishers.

* "Tuberculosis as a Disease of the Masses and How to Combat it." M. Firestack, New York, Publisher.

I am convinced that when our philanthropists and our higher federal, state and municipal officials, through your work as health officers and that of the medical profession in general, will have become more thoroughly acquainted with the true causes of consumption and the modern means of its prevention and cure there will not only be an improvement in the facilities for the cure, but also for the prevention, of tuberculosis. What I mean by these underlying causes I have already hinted at, for the extermination of tuberculosis cannot be accomplished without improving the housing and the social conditions of our laboring population. If we do not want to keep up a continuous supply of candidates for the sanatoria of consumptives we must have more model tenements with plenty of light and air, improve sanitary conditions of workshops, factories, stores and schools, we must have more parks and playgrounds for children and laws whereby the conditions of the honest but poor laborer and his family will be improved in every respect.

To you, my confreres, who are trained sanitarians and public officers, I will say a final word as to your duty in regard to this great tuberculosis problem. The first thing I must beseech you, if you have not already inaugurated up-to-date anti-tuberculosis regulations in your respective communities, is to do so at the earliest moment. Carry out the very best, most thorough, scientific, practical, rigorous and yet humane measures to combat the spread of tuberculosis. Remember that thus far experience in the anti-tuberculosis crusade, not only in this country, but all over the world, has taught us that the most good can be accomplished by instructing the patient and his family, and that it is wiser to educate the people than to frighten them into obedience of sanitary laws.

Be valiant crusaders against this disease, but I beg you in all earnestness and sincerity, be watchful that through the overzealousness of anyone this war against consumption may never degenerate into a war against consumptives. Be their true friend and protector and give no one a chance to say that you are an enemy of the consumptive patient. Make your influence felt in your community and plead with the higher officials and the wealthy philanthropists of your cities and states for the establishment and maintenance of municipal and state sanatoria, for improved housing and better sanitation in general. Present to your state and municipal government the facts of economic loss to the commonwealth for not caring for the large number of consumptive poor adults who could be cured.

According to Prof. Hermann M. Biggs, the chief health officer of New York City, who has made the subject of tuberculosis a close study in all its aspects—medical, social, and economical—the annual cost of consumption to the municipality of the city of New York is not less than $23,000,000, and to the country as a whole $330,000,000. I presume this loss is the result, first, of the consumptive ceasing to be a wage earner and he himself and his family becoming burdens to the community, and in other cases by the patient lingering in some public home or hospital until his decease.

Now let me add another calculation to that of Doctor Biggs. My somewhat extensive experience with the various sanatorium movements in my own state (New York) and in others of the Union has convinced me that there is up to this time scarcely accommodation for one out of thirty of the consumptive poor. The sojourn of a patient for one year in a well-equipped sanatorium costs about $500; the average loss of his earning capacity is about $800; the probable support given to his family from charitable sources $100; total $1,400. Not treated, that patient will probably linger from two to three years; loss of earning capacity at least $1,600; at least one year of support in a public home or general hospital about $300; the support of the family at least $200; total $2,100. You see that I have taken the lowest figures for the support of the family since not all consumptives are married or supporters of families. We spend, nevertheless, in the United States only $11,000,000 for the treatment of consumptives in sanatoria where the chances of cure are from 50 to 75 per cent. Thus, there is a loss to the country of $319,000,000 yearly, since among the poor the sanatorium alone offers a reasonable chance of returning the pulmonary invalid restored to the community. Yet, rightly used, the $319,000,000 could take care of 227,857 more poor consumptives, isolate, treat, and educate them, counting the $800 loss of earning capacity and $100 for annual support of family. Of these 227,857 patients at least 150,000 would be given back to the community after a year's time as breadwinners and useful citizens.

These 150,000, being cured, do not require a second year of treatment and support of the family, which would amount to $75,000,000; but they add to the commonwealth $800 per head through their earning capacity, which means $120,000,000. Thus, by having taken care of the consumptive poor in the right way, at the right time, and in the right place, we would gain a total of $195,000,000 in two years.

It does not require an expert mathematician, nor is it necessary to possess a prophetic vision, tc see that the money which is now spent uselessly, if rightly used would surely lead to the ultimate eradication of the disease. The figures which I have presented to you should give us food for thought and should cause us to ponder over the true meaning and place of the sanatorium in the treatment and prevention of tuberculosis as a disease of the masses. Would it not almost seem as if the time had come for the creation of a National Tuberculosis Commission with its seat in Washington? When the sanatorium alone can be instrumental in adding so much to the nation's wealth, so much to the nation's health, so much to the moral and general education of thousands of its citizens, and last but most important of all so much to the happiness, joy and longevity of the individual sufferer and his family, surely this anti-tuberculosis work is worthy of the support and consideration of the foremost citizens of the land and the highest officials of the nation.

NOTE.—Dr. Knopf exhibited lantern slides of various sanatoria and their furnishings.

Discussion by Dr. H. E. Lewis, Burlington, Vt.

Mr. Chairman, Ladies and Gentlemen:—I am sure we all appreciate the opportunity of hearing one who has devoted so much study to the tuberculosis question. We cannot fail to appreciate the broad way in which Doctor Knopf has treated his subject and the many interesting thoughts he has given us. The question is one that must interest us all, for it concerns not one class, but all people, irrespective of their vocation or position in life. Indeed it is too often a personal question and one that may at any time be brought into our homes. With insidious step it may creep into our midst, and snatch from us one whom we love or cherish better than life itself. Day after day we may see that dear one going down, down, down, and be absolutely powerless to do a thing to stop the progress of the disease. One who has passed through all this, the anguish and powerlessness, well realizes how momentous a question tuberculosis is, and can understand the urgent need of all people uniting to conquer if we can this scourge of humanity. It is true that if the solution of the problems that confront us is ever found, it must come through the people themselves. Our own endeavors, our individual influences, financial and otherwise, must be freely exercised, and through intelligent, concerted effort a large measure of success may be achieved.

In the long study that has been given to this question, it has been learned that the sanatorium treatment offers the greatest hope. It is not uncommon though for patients to come to us and say: "Doctor, you say it is good fresh air, it is good food that we require, to get better; now why can't I go to my own home and get these same things? I can have all that the heart can wish for, why can't you do as much for me there?" We have to go to work and explain that in the sanatorium the conditions are different. The tubercular patient is one of the hardest patients that medical men are called upon to treat. They are hard to control. That is the keynote. In an institution with the best of discipline, where everything is done by routine and system, it is easy for the doctor to get a patient to comply with the rules. In other words it is the mode of living that accomplishes so much, what the Germans call *die lebensweise.* The consumptive is an unusually hopeful patient and the instant he begins to gain, he thinks the worst is over; after we have spent days, weeks and months in getting him up to a point where he really is better he may throw it all over in a half hour by overdoing, and so all our energy is spent uselessly.

I was very glad to hear what Doctor Knopf has told us in regard to the location of a sanatorium. It seems to me it is one of the most important questions.

In the past it has been thought necessary as soon as a patient commences to lose flesh and break down that he must be sent away to a high altitude, more or less remote from his own home. What has been the result? While he may go with the utmost hope and willingness, the feeling that he has to be separated from all he holds dear soon discourages him and the worst sickness of all, homesickness, rapidly overbalances any possible good from the change of climate; he goes right down and too late comes home to die. Now a sanatorium near home would accomplish far more good, for patients could see their relatives often and the environment would be so little different that he would hardly notice the change. Then again I need not speak of the great advantage of patients being cured or improved under climatic conditions identical with those of their homes. Many arguments suggest themselves, but the idea is growing that any sanatorium depends far less for success on climate, or altitude, than on pure air and good management.

Right here in connection with what Doctor Knopf has so ably said, let me speak of the paramount importance of good management in any institution for the treatment of tuberculous patients, especially the daily regulations for the guidance of patients, for the daily plan and discipline to which a consumptive conforms is really the most important thing in his life. He is obliged to rise at a certain hour; he takes his breakfast at a certain hour; then he has nourishment after his exercise, and so on through the day. He gets into the habit of this system and after a few weeks it has its effect upon him. Suppose a patient is brought into an institution and then after four or six months he leaves and goes forth with these ideas of system which he has grown accustomed to in the sanatorium and which he never fails to preach at every opportunity. Can you imagine the benefit his neighbors and friends derive from this? He is the leader of hygienic rules among his neighbors and friends, a veritable propagandist of pure air, good food and systematic living.

The hour is so late that I do not wish to take up your time, but I would like to say a few more words. You are probably all aware that at the last legislature steps were taken towards the establishment of a sanatorium in this state. The legislature passed a bill providing for a tuberculosis commission; they are to investigate the prevalence and extent of tuberculosis in Vermont; the need of a state sanatorium for consumptives; and report with recommendations to the next legislature. The commission has studied the question carefully and learned certain things. One very important fact is this: that altitude has had no effect on the prevalence of tuberculosis in our state. Grand Isle county, with the lowest elevation and made up largely of islands, has shown the most wonderful absence of tuberculosis. It is the only county in the state which can show no deaths from tuberculosis in 1900. Many other important facts have been learned. It is certain that we can accomplish nothing unless we have the medical profession and all public-minded citizens with us. We must have the backing of the people. We can, with proper help, obtain an institution in the state of Vermont that will help us to lower the mortality of this disease. Therefore I would earnestly enlist the support of every one here to help this movement along and with united effort we can surely accomplish something before the legislature. The greatest advantage which is going to come from the sanatorium aside from the educational is that the medical profession will recognize this disease earlier; and if we are going to cure this disease, we have got to attack it in its first stages. Pardon the bull, but to cure the disease we must treat it before it begins. Susceptible individuals must be recognized and built up; infected ones must be placed under favorable conditions and taught to live. A state sanatorium must come sooner or later, and when it does Vermont will witness a remarkable decrease in a disease that claims many unnecessary victims each year.

Discussion by Dr. B. H. Stone, bacteriologist, State Board of Health, Burlington, Vt.

There probably was not a man in the room last night who was not thoroughly convinced of the efficacy and need of a sanatorium for the treatment of tuberculosis. That is a vital question which we are all willing to admit in reference to urban communities, but whether we are willing to admit the need of such an institution in a rural community like Vermont is another question.

It seemed to me, before giving the subject any study, that here in this state among this population which is essentially rural, the elements of sanatorium treatment could be gotten at home. It seemed to me that we had plenty of fresh air and that even the poorest could get that, but since thinking it over my views have materially changed.

The essentials of the sanatorium treatment of tuberculosis may be summed up under five different heads: (1) Life in the open air—and I mean really *life in the open air,* day time and night time. (2) Plenty of nutritious food (3) General hygienic measures. (4) Properly regulated exercise and rest. (5) Freedom from care. How many of these essentials can we procure here in Vermont? Assuming we can get plenty of fresh air, I should say that the other four points are just as difficult to procure here as anywhere else.

A large number of tuberculosis cases are among the working class or poorer class, and it is just as impossible to obtain nutritious food and proper hygienic measures, and freedom from care among such people here as anywhere else.

As for life in the open air, although you may convince the patient that it is necessary, you cannot convince his friends. His family would stand aghast, and pretty soon some one else would be treating that patient. Perhaps the best way to get at the question is to consider the actual statistics of home treatment in Vermont. Our tuberculosis cases here in Vermont are home treated cases, with few exceptions where the families are wealthy enough to send their relatives outside of the state. We will consider the percentage of cases which are being cured.

We recently sent out from the Laboratory letters and cards, requesting subsequent history of tuberculosis cases from which sputum had been examined, and I will give you some percentages which I obtained therefrom. These cases were examined in 1899, 1900, and 1901, comprising a period of from four and one-half to one and one-half years distant from the present time. We had a generous response from these cards. There were 374 cases heard from in time to be tabulated; most of these were incipient cases at the time of the examination. Out of the 374 cases, 279 are dead and only 95 living. Of the 95 which are living, there are only 59 which, in the doctor's opinion, are improved, and 36 in which the prognosis is given as good. Of this total there are only 17 thought to be cured at the present time, or only 4 per cent. Of the 95 cases which are living, 33 have been treated in sanatoria outside of the state.

Doctor Knopf stated that from 50 to 75 per cent were curable under sanatorium treatment.

I think we need sanatorium treatment here as much as any place in the country, for there are only thirteen states in the Union which report more deaths from tuberculosis than we do. The question is, Have we a climate suitable for the treatment? This question was well answered in Doctor Knopf's paper. The climate to which these patients are accustomed and in which they have lived and into which they must go after treatment is the climate most suitable for their cure.

PRESENT CONDITION (JULY 15, 1903) OF 374 TUBERCULOSIS PATIENTS WHOSE SPUTUM WAS EXAMINED WITH POSITIVE RESULTS DURING THE YEARS 1899, 1900, 1901.

CASES LIVING.

No.	Sputum Ex. Showed.			Improved.			Cured.			Prognosis.			Treated.			Duration of Disease—years.							
	Few.	Moderate Number.	Numerous.	Yes.	No.	Not Stated.	Yes.	No.	Not Stated.	Good.	Bad.	Not Given.	At Home.	In Sanitarium.	Not Stated.	1	2	3	4	5	6	7	8
95 (25%)	56	16	23	59	23	11	17 (4%)	76	2	39	31	25	34	33	28	9	39	25	14	7	..	1	..

CASES NOT LIVING.

279	97	78	104	....	....	....	....	....	....	....	....	....	114	24	141	39	93	68	59	13	5	1	1

Discussion by Dr. W. N. Bryant, member of State Commission on Tuberculosis, Ludlow, Vt.

It was a pleasure to listen to Doctor Knopf's paper, and we certainly were filled with the topic after listening to it. Even if we had no interest in the topic under discussion, it would have been a pleasure to listen to him.

I hardly think it is necessary to say anything further upon this topic, for it has been so ably, thoroughly and fully discussed that there are but a few points left. I am, however, glad to bring to your notice at this time points in which I am particularly interested. The subject of tuberculosis has been more widely discussed than almost any other. There is no epidemic which engages our attention, and our time, as much as does the epidemic of tuberculosis. And when we have a chance to listen to such a man as spoke to us last night, we can well stay and listen and learn.

In regard to the matter of tuberculosis, every one has his opinion, and we get some very good opinions if we stop to listen. This is a question of particular importance at this time, as we are investigating this matter and trying to get at something that will be useful to Vermont. Some people say to us, Why are you making this holler about tuberculosis in Vermont? Here is where people come to be cured from it. This is why: Vermont, notwithstanding her boasted population, her verdant air, her healthful localities, contributes each year five hundred victims—we stand beyond the average death rate. It seems to me that the matter involves so much of life and happiness that it should demand our most serious attention. We want to get this notion out of your heads, if you have it, that we don't need a sanatorium in Vermont, for we do. My belief is that what we need and what we must have here in Vermont is a state institution, a sanatorium not only for the cure of the five hundred patients, but to protect the spread of this dread disease.

When we try to treat tuberculous patients at home, what do we try to do? We try to make the surrounding conditions as nearly as possible approximate to the conditions in the sanatorium. What does that prove? It is proof that we try to imitate the sanatorium. Why do this, then, when we can have the real article? We hope for better things. The reasons why we cannot make the home treatment as valuable as the sanatorium treatment are various. Drug giving cuts but a very small figure in the treatment of tuberculosis. That can be attended to anywhere. The salvation of the patient depends upon the physical and hygienic conditions. You may go in to see a patient and say, Well, keep in the open air. What does that amount to? The routine which you place upon him is hardship. It is a hardship to take a certain amount of exercise. It is a hardship to take exercise in the cold winter or in the warm summer. The life of the tuberculous patient must be stern and rigid. They have got to do these things regularly, and at home they wont do them. They are surrounded by friends and they sympathize with them. In a sanatorium they are trained to do certain things, and after awhile it becomes easy. People come to us and say, What do you want a sanatorium here in Vermont for? If you have a sanatorium it is going to take away our patients and our business. Don't look at it in this light. It is a question of saving lives and should be looked at in an altogether different light. The educational value of a sanatorium has been brought out and it is unnecessary for me to refer to it again. The value of a sanatorium cannot be measured by the number of patients it cures. If we had a sanatorium and not one single patient was cured there, it has paid for itself over and over again by the education each patient will receive there; they will go out into their individual communities as missionaries. Thus you will readily see its educational value.

I wish you would take these things home with you and ponder them alone in your heart. You must not think because you have a commission to investigate the matter, that you have nothing to do; you must not shirk your duty. We were appointed to investigate this matter, and we want to stir up your minds and get you to realize and understand the exact facts in the case. We all know that tuberculosis is contagious. We may not contract tuberculosis even if a tubercular patient coughs in our face, but the fact is we may. What is the use of seeing how near we can come to danger and avoid it? My advice is keep as far from danger as you can. It is all right and natural for physicians to discuss the degrees of contagiousness of this dreaded disease. A man approached me recently whose wife was at a sanatorium, and he says that you fellows contend that tuberculosis is not contagious; that it was only the condition in which you happened to be which influenced the disease. We can let it alone, for we know it is a contagious disease and that surely is enough. Now, when we ask as a commission for your hearty support, we want your undivided help. It is economic, gentlemen.

Discussion by Dr. E. F. Norcross, Island Pond, Vt.

Doctor Stone's statistical statements are truly appalling; it must be that most of those cases were beyond hopeful treatment when the specimens were sent. Among that number, I submitted one specimen for examination. The reason I submitted it was for my own protection and satisfaction. The sample sent to the Laboratory was from a young man who was acting as janitor in our high school building. Being health officer for the town, I felt it was my duty to make objection to his acting in that capacity. The moment I did so, his friends and family stated that I was unnecessarily strict in my action, and that I was taking the only job he could do, away from him. The health of those children was far above any personal interest, so to protect myself I submitted this specimen, with the result that my action was more favorably looked upon, when it was known that the specimen showed the tubercle bacilli.

I would like to ask the professor if at the present time in connection with sanatorium treatment there are any new drugs that he would especially recommend?

Discussion by Dr. J. W. Copeland, Lyndonville, Vt.

Would you advise sending a hopeless case to a sanatorium?

Dr. S. A. Knopf, New York City.

The question of home treatment has been mentioned. Gentlemen, for the time being, the sanatorium treatment at home is very important. I have advocated the sanatorium for years, but circumstances may arise where the family cannot send the patient away; where he may be too far advanced; where there may not be room enough for him in the sanatorium; the sanatorium may not be ready, or he may be so attached to the family that he cannot be taken away; then the course to be pursued is home treatment. The first thing, he must have his own individual room, the most cheerful room in the house. Now, if you can have built an extension and have him sleep by himself it is of great advantage. The soiled linen of the patient must always be put in a tub of water, so the dust cannot be floating in the air. Be as careful as you can concerning the sputum. There is great danger from inoculation as well as from inhalation and ingestion. Have the milk boiled or sterilized, and if there is any doubt about the meat have it thoroughly boiled. Whoever cleans the spittoon must be careful and not have a sore on his hands, for he is very apt to get some of the waste material into it. I recommend the use of rubber gloves when cleaning around such utensils. Now for the rest cure. Have a reclining chair; have a window taken out and have the patient sit where he can breathe all the fresh air into his lungs that is possible. Give him the benefit of the sunlight. Place the chair so he will have a pleasant view. What are you going to do if there is no bath tub? In the humblest home you can use cold water. Get your patients accustomed to cold water. If he is afraid of cold water, put in a little warm water and then rub him down with alcohol. Give your patient sun baths often. I don't agree with Doctor Bryant regarding the contagiousness of this disease. I have been taught that tuberculosis was not a dangerous contagious disease. It is a communicable disease. Now take smallpox and consumption for comparison. Smallpox is a dangerous contagious disease. Consumption is only a communicable disease. We know the factor of contagion in consumption. If a man was to tell you he had consumption without the bacillus, tell him he don't know what he is talking about. We don't know about smallpox. I defy any sensible man to go without fear into a house where smallpox patients are, not being vaccinated, and come out without catching this disease, but if he goes into a well-regulated sanatorium, I am sure he would not catch tuberculosis, provided he used ordinary care. No matter how well regulated a smallpox hospital may be one is sure to catch it. I know of a servant girl being discharged, not because she was consumptive, but because it was said there was consumption in the household.

I mentioned last night that it is very essential not to neglect our little ones. There are many scrofulous children who are not taken care of. I really do not see why you can't have a sanatorium for the treatment of scrofulous children. The majority of consumptives ranged from eighteen to thirty-five. When a person at eighteen has consumption, you can almost always trace back to some scrofulous disease in early childhood. I believe that seacoast climate is very beneficial in the treatment of scrofulous children.

I think consumption can be cured without drugs. Creosote is all right if you don't give too much of it. It is very good in small quantities. If I think creosote will help my patient as a tonic, I give one drop three times a day in milk, and then I increase to two, then three, and then four, but I never go higher than fifteen drops in a day. With the slightest digestive disturbance, I stop, and if he gets along nicely, I don't give him any more. I let creosote be a tonic. You can kill bacilli with creosote, and you can also kill your patient with creosote. Now as to general exercise. I don't believe in exercise when the patient has a fever. When my patients have a fever, I put them on their backs, even in bed. Give them absolute quiet. You can attain great results by simple rest in the open air. If the patient has a fever, I put him at rest, and if he has a high fever I put him to bed. If over 99.5 I put him in a reclining chair, but I never allow one of my patients to exercise himself when he has a fever.

I also try cold water. You have no idea how soothing it is. You should sponge the patient off with cold water every two hours. Put him between two sheets and let him sweat. How are you to determine how much exercise you can allow your patient? The only means is the temperature. Take the temperature every night. Take the temperature before he walks and then after and you can readily ascertain when the exercise is sufficient. Never treat consumption, but always treat the consumptive.

Discussion by Mr. E. B. Moore, Rutland, Vt.

Wouldn't you keep scholars from public schools when they are afflicted with consumption?

Prof. S. A. Knopf, New York City.

What kind of consumption do you mean?

Discussion by Mr. E. B. Moore, Rutland, Vt.

Pulmonary tuberculosis.

Prof. S. A. Knopf, New York City.

I would dismiss him for his own benefit as well as for the other pupils.

Discussion by Dr. T. R. Stiles, St. Johnsbury, Vt.

Regarding altitude, professor, you did not answer that.

Prof. S. A. Knopf, New York City.

If you have an altitude, utilize it; if you have a porous soil, utilize it; if you have a southern exposure, utilize it; if you have not any of these, do the best you can without them.

Discussion by Dr. S. E. Darling, Hardwick, Vt.

I wish to inquire, Do you consider scrofulous children suffering from tuberculosis in a mild stage, or do you consider them more susceptible to tuberculosis?

Prof. S. A. Knopf, New York City.

It is only a mild type of tuberculosis. It is the same disease only a different manifestation. The cause of scrofula is exactly the same as the cause of tuberculosis. You find scrofulous children in dark tenements and where they are underfed. You will find a great many scrofulous children in Switzerland. Scrofula is a mild stage of tuberculosis, and the more children you cure from scrofula the more you cure from consumption.

In Berlin we find by statistics that the children most frequently absent from school are scrofulous. In order to keep those children at school they must do something. They give those children every lunch time two good meat sandwiches and one or two glasses of milk. They increase in weight and consequently feel better and give more attention to their school work. Boston has followed the example. This is one of the means of preventing scrofulous children from becoming consumptives.

Discussion by Dr. T. R. Stiles, St. Johnsbury, Vt.

I had the pleasure of listening to a part of Doctor Knopf's paper last evening, all of which I enjoyed; but in connection with it, there was a point or two that I wanted to bring out especially for further discussion. Now, with reference to altitude in the establishing of a sanatorium and with reference to the exercise by the patient, I understood Doctor Lewis to say that he placed but little importance on the question of altitude, and I also understood him to say that he would not encourage exercise on the part of the patient. I speak of this to bring out a discussion. Perhaps I did not fully understand Doctor Lewis with reference to this, but I simply speak of this for further discussion.

THE MANAGEMENT OF OUTBREAKS OF MEASLES AND WHOOPING COUGH.

By Dr. Henry D. Holton, Secretary State Board of Health.

The proper care, from a sanitary standpoint, of measles and whooping cough has been given considerable attention by health authorities at different times, the concensus of opinion being that it is the duty of health officials to prevent the spread of these diseases.

It is true that a large number of people in a given community profess to be of the opinion that every person should have measles, and the sooner the child has the disease the better. Many physicians endorse this view, erroneous as it certainly is. This disease of itself is usually mild, and seldom results fatally except by reason of complications or sequelæ. The most frequent and important complications are those involving the mucous membranes of the throat and upper air passages. Serious and often destructive disease of the eye is set up, resulting in permanent injury to the sight, or under more fortunate conditions only to impairment of vision which lasts through life. The laryngitis and inflammation of the large bronchi, while giving much suffering, are not to be compared to capillary bronchitis in severity of danger; every practitioner recognizes the serious nature of this affection when not a complication of measles. When, however, we have a patient with vital powers depressed, mucous membranes of the bronchi irritated and swollen as a result of this disease, often secreting large quantities of thick tenacious mucous, filling the small bronchi, producing severe depression, we realize the danger that has overtaken our case of measles. However, the most dangerous acute complication is catarrhal pneumonia, which is the immediate cause of death in many of the fatal cases of measles. At the outset of this complication the eruption disappears, hence it is said the measles have "struck in," or that the measles have passed, but the patient has pneumonia, from which he dies without the fact being noted that if he had not been exposed to and suffered from measles, he would not have had the fatal pneumonia. A little later we find that tuberculosis has established itself, usually in the lungs, meninges of the brain or some of the joints. The mucous surfaces of the air passages are in a state of irritation and vascularity that makes them a most desirable nidus for the development of the bacillus tuberculosis; it is also true that a joint previously infected by this bacillus immediately takes on an active development when the patient suffers with measles. If no previous disease of the joint has been manifested we sometimes see rapid development of tuberculosis as a sequel of measles. There are other sequelæ which occur less frequently, but which, when they do, are equally serious. Most of these complications when proving fatal are given as the cause of death, and nothing is said of this preventable exanthemata as being the true source of death.

Shall we as sanitarians, working to prevent as far as possible disease from attacking the human family, be careless or negligent in this respect, in the case of a disease that we know is frequently followed by such a train of murderous complications and sequelæ? There can be but one answer,—we must prevent its spread by every means at our command. Isolation of those exposed and affected offers the only means of preventing its communication. It is an open question if the contagion can be carried by persons who are immune in their clothing or otherwise. There are a few reported cases where this has apparently been done; they are, however, so few that as a board we have considered it sufficient to institute a modified quarantine. To be effective this quarantine should begin in eight or nine days after the person has been exposed to the disease. The prodromal stage covers a period of three or four days; hence isolation can only be effective by beginning with it before the prodromal stage has been reached. If this is done an epidemic can be prevented. How often it occurs that a person known to have been exposed to measles goes during the prodromal stage to some public gathering and communicates the disease to most of those present. To make this early isolation effective all sanitarians, which in this state means all health officers, should embrace every opportunity to educate the people and have them fully understand the serious results that may follow an epidemic of measles as well as whooping cough. This latter disease is a most serious one, occuring as it usually does in young children, rarely directly fatal, yet frequently causes death by complications. Many observers agree that this is one of the most fatal diseases of early childhood. In the first three months of this year 511 cases of measles resulted in only one death, while in 230 cases of whooping cough there were three deaths. In the first, or catarrhal, stage it is hardly possible to make a diagnosis. This stage usually lasts from seven to ten days; before the end of this time the increasing spasmodic character of the cough will cause a very strong suspicion that whooping is developing. Isolation should commence with the spasmodic stage and should continue until the characteristic cough has ceased. All of the complications of which we have spoken as likely to appear during or following an attack of measles may occur in the course of whooping cough; in addition the little patient sometimes succumbs to exhaustion, particularly the result of the inability to retain sufficient food, and the loss of blood the result of epistaxis; convulsions resulting from the nervous disturbance may end in death. I have a history of eight cases of paraplegia and three of poliomyelitis, resulting from whooping cough.

All practitioners are familiar with the fact that all the diseases mentioned are very likely to accompany or follow these diseases; yet we know that there are some physicians who object to enforcing any restrictive measures intended to prevent the spread of these diseases. Recently one of the local health officers in this state, a layman, said to me that "it was up hill work for a non-professional health officer to attempt to quarantine and thus control their spread, when medical men who were health officers in nearby towns publicly expressed the wish that every one who had not had either measles or whooping cough would have them, that quarantine ought not to be enforced". My command of language is not sufficient to express the contemptible degradation into which the moral instincts of such a medical man has fallen. It is the duty of every health officer not only to institute quarantine and see that it is observed whenever either of these diseases is reported as having appeared in any family within his jurisdiction, but he should also be alert to what is going on in his town, and whenever he learns that it is suspected by any one that there exists a case of any communicable disease he should, according to Section 11 of No. 113, Laws of 1902, make such a sanitary inspection as shall be necessary to satisfy him as to the correctness of the suspicion. If he finds either of these two diseases he should proceed as already indicated. The isolation in case of measles should last until desquamation and catarrhal symptoms have come to an end; in whooping cough until characteristic cough has ceased. In all cases his action should be prompt; while in every way he should exhibit a spirit of kindness, he should show a firmness of purpose, never being a respecter of persons. All his duties should be performed so as to impress the people that he is simply doing an official duty; that he will see that his directions are obeyed, not because he has given them, but because it is the law and there is no other way except to obey it.

Discussion by Dr. F. L. Osgood of Townshend, Vt.

I wish to compliment the doctor for bringing this subject so clearly and so pertinently before the School in this brief paper; and all I can say by way of discussion is to emphasize what he said on the matter of quarantine.

It is time physicians should put aside the old idea that every child ought to have these diseases in order to fit them for their life work. In view of the serious complications and sequelæ that may accompany or follow them, every means at our command ought to be employed to prevent their spread. The patient should be as strictly quarantined as with other infectious diseases during the period when they are likely to spread them.

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BULLETIN OF THE
VERMONT STATE BOARD OF HEALTH.

The Bulletin is published quarterly by the State Board of Health under the authority of Section 5 of Act No. 90, Legislature of 1900. It will be sent to all Boards of Health. A copy will be sent to any person in the state upon request addressed to the Secretary, Henry D. Holton, Brattleboro.

NEWS ITEMS.

A French physician, Doctor Marechal, advocates the passing of a law making the wearing of a corset by any woman under thirty an offense punishable by three months' imprisonment, if she be of age, and a fine of from $20 to $200 imposed on her parents or guardians if she be under age.

We would call attention to the fact that all sanitarians are striving to perfect the reports of vital statistics. To that end we would urge every physician in the state to aid in this work by giving in every birth and death certificate all the facts accurately stated, plainly written, and promptly reported, as required in Sections 9 and 10 of No. 114 of Laws of 1902. The last paragraph of these sections states the penalty for neglecting to make these returns. It is important that these reports should be made with especial promptness, as town clerks are required by the same act to make their returns to the secretary of the State Board of Health every six months.

Vital Statistics. At the recent meeting of the American Public Health Association, held at Washington, the Committee on Vital Statistics reported that effective coöperation had been instituted between that association, the Conference of State Boards of Health, the American Medical Association, the United States Census Bureau, and the United States Public Health and Marine Hospital Service, for the improvement of the vital statistics of this country. Among the objects sought are the extension of adequate methods of registration, the use of uniform and comparable tables and rates in bulletins and reports, and the improvement of the international classification of causes of death. A pamphlet on "Statistical Treatment of Causes of Death" has been issued by the United States Census Bureau, requests for which should be addressed to Mr. W. A. King, chief statistician for vital statistics, Census Bureau. It has special reference to the difficulties encountered in compiling deaths returned from several causes, and asks for the coöperation of the profession in framing a thoroughly satisfactory method of procedure in such cases.

Diphtheria. In some localities of the State diphtheria is prevailing in a mild form. Failure to report these cases, or an error in diagnosis whereby it has been called "tonsilitis," has caused it to be communicated to others; hence we find the disease spreading, not only in the communities where it first developed, but to adjoining towns, and a few deaths have already taken place. Read carefully Section 17 of No. 113, Acts of 1902, which is as follows:

> SECTION 17.—The head of a family in whose home there occurs a case of infectious or contagious disease dangerous to the public health, shall immediately give notice to the health officer of the town or city in which he lives. A physician who knows or suspects that a person whom he has been called to attend, is sick or has died of a communicable disease dangerous to the public health, shall at once quarantine and report to the health officer the place where such case exists, the name, degree of virulence thereto as may be necessary for the health officer to make examination and act in the premises. If the head of a family or physician fails to give reasonable notice to the health officer of the existence of such disease, he shall on conviction thereof pay to the treasurer of the state a fine of not less than ten dollars, nor more than fifty dollars, with costs of prosecution.

If a person has a sore throat, although apparently there is no exudation or only slight spots on the tonsil, a culture should be taken from the throat and posterior nares and forwarded to the Laboratory for examination and report. Quarantine should be instituted pending the result of the examination. Notice that the statute only requires that there is a *suspicion* of a communicable disease to require a report.

Professor of Hygiene. Dr. Charles S. Caverly, president of the State Board of Health, has accepted the appointment of professor of hygiene in the medical department of the state university. This is certainly a forward movement for the university and will prove of great good to the state in giving to the future doctors, who will be so fortunate as to be under the instruction of Professor Caverly, a knowledge of sanitation and sanitary laws.

Vital Statistics for 1902. In compiling the vital statistics for the year 1902, for the state, we find the death rate per thousand of the population is 16.03 per cent, which is practically one per cent less than the previous year. The following table gives the mortality by counties of the various communicable diseases as well as cancer. Also showing the number that lived to die of old age. Of the number living to the advanced age of ninety-five years or over, nine were over one hundred years old.

COUNTIES.	Population.	Deaths from Pneumonia.	Deaths per 1000 of Population.	Death from Tuberculosis.	Deaths per 1000 of Population.	Deaths from Scarlatina.	Deaths per 1000 of Population.	Deaths from Diphtheria.	Deaths per 1000 of Population.	Deaths from Typhoid Fever.	Deaths per 1000 of Population.	Deaths from Whooping Cough.	Deaths per 1000 of Population.	Deaths from Measles.	Deaths per 1000 of Population.	Deaths from Cancer.	Deaths per 1000 of Population.	Deaths from Senile Debility.	Deaths per 1000 of Population.	Deaths of Persons 95 years of Age and Over.	Deaths per 1000 of Population.
Addison.....	21,912	48	2.19	29	1.32	......	......	1	.05	8	.37	......	......	2	.01	18	.82	21	.96	2	.09
Bennington.	21,705	29	1.34	21	.97	......	......	......	......	2	......	3	.14	2	.09	18	.83	17	.79	2	.09
Caledonia...	24,381	50	2.05	37	1.52	......	......	3	.12	12	.49	1	.04	......	......	7	.29	21	.86	1	.04
Chittenden..	39,600	61	1.54	51	1.29	......	......	4	.10	5	.13	1	.03	4	.10	28	.71	55	1.39	2	.05
Essex........	8,056	12	1.49	8	.99	2	.25	1	.12	3	.37	2	.25	1	.12	2	.25	10	1.23	2	.25
Franklin....	30,198	33	1.09	38	1.26	7	.23	1	.03	4	.13	1	.03	......	......	23	.76	43	1.42	1	.03
Grand Isle..	4,462	1	.22	6	1.34	1	.22	......	......	......	......	......	......	......	......	2	.45	1	.22	1	.22
Lamoille....	12,289	15	1.22	19	1.55	......	......	1	.08	......	......	1	.08	1	.08	3	.24	6	.49	1	.08
Orange......	19,313	27	1.40	22	1.14	3	.15	5	.26	4	.21	1	.05	......	......	20	1.04	25	1.29	4	.21
Orleans......	22,024	43	1.95	30	1.36	......	......	2	.09	2	.09	7	.32	......	......	24	1.09	23	1.04	4	.18
Rutland.....	44,209	81	1.83	48	1.09	3	.07	1	.02	8	.18	2	.04	6	.14	28	.63	55	1.24	8	.18
Washington	36,607	65	1.78	63	1.72	13	.36	3	.08	11	.30	5	.14	2	.06	20	.55	28	.77	1	.03
Windham...	26,660	39	1.46	50	1.88	......	......	2	.08	2	.08	......	......	3	.11	21	.79	36	1.35	3	.11
Windsor.....	32,225	63	1.95	34	1.06	1	.03	2	.06	3	.09	3	.09	2	.06	31	.96	43	1.33	7	.22
Totals...	343,641	567	1.65	456	1.33	30	.09	26	.08	64	.19	27	.08	23	.07	245	.71	384	1.12	39	.11

The Conference of State and Provincial Boards of Health, held in Baltimore October 22 and 23 last, proposed the adoption of the following rules to govern the transportation of the dead. Before these become effective they must be adopted by the American Association of General Baggage Agents, and the National Funeral Directors' Association. The last named association was represented at this conference by Mr. L. T. Christian, who gave assurances that the association would adopt them at their next meeting. With the endorsement which will be given by the American Association of General Baggage Agents these will be the rules which will govern the transportation of the dead upon this continent:—

RULE 1. The transportation of bodies dead of Smallpox, Asiatic Cholera, Yellow Fever, Typhus Fever, Bubonic Plague, Diphtheria (Membranous Croup), Scarlet Fever (Scarlatina, Scarlet Rash), *Erysipelas,* Glanders, Anthrax or Leprosy, shall not be accepted for transportation unless prepared for shipment by being thoroughly disinfected by

(a) arterial and cavity injection with an approved disinfecting fluid;
(b) disinfection and stopping of all orifices with absorbent cotton, and
(c) washing the body with the disinfectant,

all of which must be done by an embalmer holding a certificate as such, issued by the state *or provincial board of health or other state or provincial authority provided for by law.*

After being disinfected as above, such body shall be enveloped in a layer of dry cotton, not less than one inch thick, completely wrapped in a sheet securely fastened, and encased in an air-tight zinc, tin, copper, or lead-lined coffin or iron casket, all joints and seams hermetically sealed and all enclosed in a strong tight wooden box. Or the body being prepared for shipment by disinfecting and wrapping as above, may be placed in a strong coffin or casket and said coffin or casket encased in an air-tight zinc, copper or tin-*lined box,* all joints and seams hermetically *soldered.*

RULE 2. For inter-state transportation under Rule 1, only embalmers holding a license issued or approved by the State or Provincial Board of Health or other state or provincial authority provided for by law, after examination, shall be recognized as competent to prepare such bodies for shipment.

RULE 3. The bodies of those dead of Typhoid Fever, Puerpereal Fever, Tuberculosis, or Measles, may be received for transportation when prepared for shipment *by arterial and cavity injection with an approved disinfecting fluid,* washing the exterior of the body with the same, and enveloping the entire body with a layer of cotton not less than one inch thick, and all wrapped in a sheet securely fastened, and encased in an air-tight metal*lic* coffin or casket, *or air-tight metal-lined box,* provided that this shall apply only to bodies which can reach their destination within *thirty* hours from the time of death. In all other cases, such bodies shall be prepared by a licensed embalmer *holding a certificate as provided for in Rule 1. When prepared by a licensed embalmer as defined in Rule 2,* the air-tight sealing and bandaging in cotton may be dispensed with.

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RULE 4. The bodies of those dead from any cause not stated in Rules 1 and 3 may be received for transportation when encased in a sound coffin or casket and enclosed in a strong outside wooden box, provided they can reach their destination within thirty hours from the time of death. If the body cannot reach its destination within thirty hours from the time of death, it must be prepared for shipment *by arterial and cavity injection with an approved disinfecting fluid,* washing the exterior of the body with the same and enveloping the entire body with a layer of dry cotton not less than one inch thick and all wrapped in a sheet securely fastened, and encased in an air-tight metal*lic* coffin or casket *or air-tight metal-lined box.* But when the body has been prepared for shipment by being thoroughly disinfected by a licensed embalmer, *defined in Rule 2,* as directed in Rule 1, the air-tight sealing and bandaging with cotton may be dispensed with.

RULE 5. In the shipment of bodies dead from any disease named in Rule 1, such body must not be accompanied by persons or articles which have been exposed to the infection of the disease, unless certified by the health officer as having been properly disinfected.

Before selling tickets, agents should carefully examine the transit permit and note the name of the passenger in charge, and of any others proposing to accompany the body, and see that all necessary precautions have been taken to prevent the spread of the disease. The transit permit in such cases shall specifically state who is authorized by the Health Authorities to accompany the remains. In all cases where bodies are forwarded under Rule 1, notice must be sent by telegraph by the shipping embalmer to the Health Officer, *or when there is no Health Officer to other competent authority* at destination, advising the date and train on which the body may be expected.

RULE 6. Every dead body must be accompanied by a person in charge, who must be provided with a passage ticket and also present a full first-class ticket marked "Corpse" for the transportation of the body, and a transit permit showing physician's or coroner's certificate, health officer's permit for removal, undertaker's certificate, name of deceased, date and hour of death, age, place of death, cause of death, whether communicable or non-communicable, the point to which the body is to be shipped, and when death is caused by any of the diseases specified in Rule 1, the names of those authorized by the Health authorities to accompany the body. The transit permit must be made in duplicate, and the signature of physician or coroner, health officer and undertaker must be on both the original and duplicate copies. The undertaker's certificate and paster of the original shall be detached from the transit permit and securely fastened on the *end of* coffin box. *All coffin boxes must be provided with at least four handles.* The physician's certificate and transit permit shall be handed to the passenger in charge of the corpse. The whole duplicate copy shall be sent to the official in charge of the baggage department of the ini [redacted] ecretary of the State or Provincial Board of H e from which said shipment is made.

RULE 7. When bodies are shipped by express, a transit permit, as described in Rule 6, must be made out in duplicate. The undertaker's certificate and paster of the original shall be detached from the transit permit and securely fastened on the coffin box. The physician's certificate and transit permit shall be attached to and accompany the express way bill covering the remains and be delivered with the body at the point of destination to the person to whom it is consigned. The whole duplicate copy shall be sent by the forwarding express agent to the Secretary of the State or Provincial Board of Health of the State or Province from which said shipment was made.

RULE 8. Every disinterred body, dead from any disease or cause, shall be treated as infectious or dangerous to the public health, and shall not be accepted for transportation unless said removal has been approved by the State or Provincial health authorities having jurisdiction where such body is disinterred, and the consent of the health authorities of the locality to which the corpse is consigned has first been obtained; and all such disinterred remains, *or the coffin or casket containing the same, must be wrapped in a woolen blanket thoroughly saturated with a 1-1000 solution of corrosive sublimate and* enclosed in a hermetically soldered zinc, tin or copper-lined box. Bodies deposited in receiving vaults shall be treated and considered the same as buried bodies, unless originally prepared *by a licensed embalmer as defined in Rule 2, according to Rule 1 or 3, according to the nature of the disease causing death, provided shipment takes place within thirty days from time of death. The shipment of such bodies from receiving vaults may be made within thirty days from time of death without having to obtain permission from the health authorities of the locality to which the body is consigned. After thirty days the casket or coffin box containing said body must be enclosed in a hermetically soldered box.*